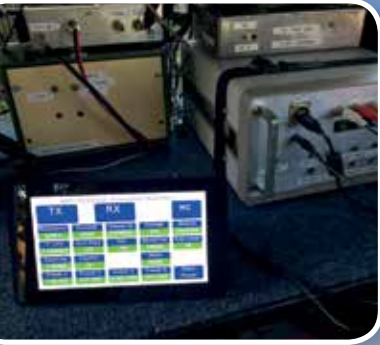




The British Amateur Television Club

CQ-TV

No. 261 – Autumn 2018



Es'Hail-2 launching soon!

**Touchscreen control of the
DATVExpress – part 2**

**CAT18 award presentations
and prizes**

BATC Test Equipment

**A Handy Signal Generator
for 10GHz**

ATV Workshop in Shropshire

Portsdown Newsletter

DATV over optical

CAT18 Report

BATC at Goonhilly

Video Fundamentals 15

**Getting ready to receive
Es'hail-2**

... and all the regular features

Telford ATV workshop

- **Saturday December 8th**

- ATV talks and workshop
- Meet other ATVers
- Get your ATV gear checked out



- **Sunday December 9th**

- Go portable for the BATC activity day (weather permitting)
- Operate your ATV gear from one of the best sites in England



- Email Heather MOHMO heather@myorangedragon.com

BATC members shop

- Hard to get components at cost plus prices

- USB modules
- Serit tuner

- Blank PCBs for BATC projects

- Portsdown transmitter
- MiniTioner USB receiver

- Portsdown Filter Modulator board

- Now reduced to £98!





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Contributions

The preferred method of communication is by email, all email addresses are shown above.

Alternatively you can write to us at:
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HA5 3YA, United Kingdom

We aim to publish CQ-TV quarterly in
March, June, September and December.

The deadlines for each issue are:
Spring - Please submit by February 28th
Summer - Please submit by May 31st
Autumn - Please submit by August 31st
Winter - Please submit November 30th

Please send your contributions in as soon as you can prior to this date. Don't wait for the deadline if you have something to publish as the longer we have your article, the easier it is for us to prepare the page layouts. If you have pictures that you want including in your article, please send them, in the highest possible quality, as separate files. Pictures already embedded in a page are difficult to extract at high quality but if you want to demonstrate your preferred layout, a sample of your finished work with pictures in place is welcomed. Please note the implications of submitting an article which are detailed on the contents page.

Chairman's Chat...

Dave Crump G8GKQ



From the (new) Chairman

First of all I need to thank Noel G8GTZ for all the time, effort and ideas that he has put into the BATC over the last 5 years. Not only has he encouraged and enabled many of us to experiment with digital ATV, he has almost single-handedly masterminded the new build of the BATC website on a modern, well-supported system. It is almost impossible to appreciate how much time Noel has put into this over the last 4 years – I know that it has been a full-time task. Thanks Noel.

I also need to thank Dave G8ADM for his work as Secretary (his second stint, having done it before in the 1960s). Not to forget Graham G3VZV for his advice as President over the last 2 years. Luckily we are not losing any of this expertise, as Noel has agreed to take on the role of Secretary and Dave is our new President. And I know Graham will still be there as a staunch supporter.

Enough of the past; what of the future? We have a new band to experiment with: 71 MHz; the possibilities for home station use have yet to be fully tested. The launch of Es'hail-2 will enable us to learn more about DATV satellite operations and to show a wider audience the capabilities of RB-TV – a mode that has only really taken off in UK and France.

On the committee, Clive G3GJA has taken on the Activity Day and Contest role, so we look forward to some new ideas there – please contact him to express your views. My thanks go to him and to the other Committee members who agreed to continue with their previous roles at the Committee meeting that we held just after the BGM.

I know that, to many of you, I'm 'the Portsdown Guru'; this only came about because I was interested in the Raspberry Pi and intrigued by F5OEO's work. I started playing with ATV at the other end of the spectrum with a valve video camera transmitting 405 line AM, but soon graduated to 625 lines and then to colour VSB transmissions on 70 cms in the late 1970s. I received early Satellite TV in the mid-1980s having built my own Ku-band LNB, and started transmitting digital ATV over 10 years ago using ex-broadcast equipment.

Unrelated facts:

- ▶ I have spent over 14 years of my career living abroad.
- ▶ I have held 4 callsigns: G8GKQ, G6AMD/T, DA4DG and DA4GKQ.
- ▶ I failed the morse test in 1974 and never looked back.
- ▶ I have never had to write computer code or design electronics as part of my job.

I'm not sure that any of those facts qualifies me to be your Chairman, but what I do hope to do is to inspire more people to join and be active in our hobby of amateur TV. The enthusiasm that I saw at CAT 18 shows what is possible – we just need to spread the word, and I would ask you to try to do that. 📡

73

Dave, G8GKQ

ATV activity weekends and contests

•Low band activity weekend

- October 20 – 21st 2018
- 71 and 146 MHz focus



•Christmas repeater contest

- Boxing day through to New Years Day
- One point per Km from Tx to repeater
- £50 to the repeater group with most contacts logged

- See <https://batc.org.uk/contests/>





The Listing

new and renewing members

Rob Burn G8NXG

Here is the list of members who have joined or renewed membership subscriptions over the period June to August 2018. It will be the first generated via the new website and although I am pleased to report that it should be more accurate than my manually generated efforts in previous editions of CQ-TV, it is still quite possible that the odd gremlin has crept in!

I can also report that our membership numbers remain stable at about 1100; thanks to all who stay with the Club and a very warm welcome to all new members.

For those members who have not yet logged on to the new site it is important to note that member passwords could not be migrated. This means that the first time that you wish to log in you will need to obtain a new password. Easy to do; just request via the Member Login page for a new password to be sent to you. If, for some reason this process does not work for you, just send me an e-mail explaining the problem.

Please keep in mind that in order to aid administration the practice of sending written reminders to members who subscribe to the full 'print version' membership has been discontinued – except for members who choose not to use the Internet. For those that do use an e-mail address it is particularly important that you check that your favourite e-mail address is correctly recorded in our member database. Your e-mail address is simple to check or change; just visit your 'Account Dashboard/Update Membership' page on the website. This is a useful page as you can update a number of personal preferences including your password, streaming details and mailing addresses.

Finally, please note that the correct subscription renewal process assumes that you have logged in beforehand, before proceeding to the online shop. If you miss this step you may end up starting a new member account rather than renewing your existing subscription! And a final, final: please do not attempt to renew your subscription more than 14 days before expiry of your current subscription term; the system is not configured to behave in any other way! 📧

Argentina		
Fernando Costarelli	LU1HKO	Cordoba
Australia		
Wayne Gooda	VK4YWG	Cranbrook
Hilary Bridel	VK2AZ	Glenmore Park
Jesse Brain	VK2ZJB	Picton
David Carwana	VK5DMC	Port Pirie
New Zealand		
Steve Fogerty	ZL2ASF	Nelson
Sri Lanka		
Shan Wickermesingle		Colombo
Austria		
Peter Stiassny	OE1PYW	Wien
Belgium		
Baudouin Jean	ON2BJ	Jurbise
Jean Paul Mertens	ON7AMI	Zevergem
France		
Philippe Cappelle	F5AOD	Chatillon-le-Duc
Saitner Gerard	F5GQ	Roquevaire
Wittmer André	F1FDB	Sarrewerden
Germany		
Hans Haller	DD5KP	Berlin
Oliver Amend	DG6BCE	Bremen

Dirk Wessel	DG5OBX	Bückeberg
Helmut Volpp	DL9SDL	Mainhardt
Hans-Jochen Fries	DK1MG	Merzig
Hans-Peter Neuber	DD1IA	Pirmasens
Frank Spiegel	DG2FSP	Roehrsdorf
Martin Blanz	DL9SAD	Schwieberdingen
Ireland		
Don Kelly	EI8DJ	Crosshaven
Italy		
Achille Galliena	I2GLI	Milan
Gianfranco Manuelli		Rome
Netherlands		
Bert Harms	PA3AOD	Hooghalen
Hans Holtkamp	PA3CGN	Losser
Peter de Heer	PE1PYT	Maassluis
Norway		
Trond Jan Øglend	LB9PH	Røyneberg
Arvid Andreassen	LA7QM	Tromsø
Poland		
Robert Went	SQ3AUV	Poznan
Portugal		
Jacinto Rebelo	CU2ED	Feteiras

Spain

Terry Cooling	EA3EWO	Lliria
Oriol Agusti Costa	EA3HUW	Barcelona
Jordi Escayola	EC3FQ	Cardedeu

Sweden

Gert Carlsson	SM5LWC & AA7G	Linköping
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United Kingdom

Graham Felton	GW0FEM	Amlwch
Ralph Moyle	G0UWB	Banbury
Ken Roberts	G8VDP	Barnsley
David Cromie	G1OWCE	Belfast
Peter Morys	G4HQX	Berkeley
Phil Hayes	M0PIT	Bletchley
Roger Ray	G8CUB	Brentwood
James Colwill	G0DQH	Chandlers Ford
Steven Cooper	G3YTI	Darwen
James Welsh	G4YLB	Darwen
Kenneth Aspden	G8WZW	Darwen
Andrew Hood	GM7GDE	East Kilbride
Steve Barrett	G4HTZ	Great Wakering
Bryan Margarson	2E0GYX	Grimsby
David Pykett	G0IIQ	Grimsby
Simon Kennedy	G0FCU	Guildford
Raymond Gifford	G7SGM	Hemel Hempstead
Fraser Stuart	G8FEZ	Herne Bay
Simon Lloyd		Hersham
Michael Scott	G3LYP	High Wycombe
Fred Young	G7NBV	Kettering
Nigel Booth	M0CVO	Kirkby in Ashfield
Steve Greaves	2E0XAY	Leicester
Dave Davy	G6EWP	Lincoln
Graham Smith	2E0JOG	Loughborough
Ron Satterthwaite	G6BMY	Manchester
Paul Bowen	M0PNN	Newport
Steve Sorockyj	G0LCG	Nottingham
Ron Harrison	G8DVR	Partington
Colin Richardson	M0YXR	PICKERING
Christopher Tidwell	G0DAE	Portsmouth
Brian Pilcher	M1DMR	Portsmouth
John Robb	M0JRZ	Reading
John Steele	GM6BRU	Roslin
Geoff Boyce	M1AHN	Ross-on-Wye
Zygmunt Skrobanski	G3XDZ	Roswell
Ian Saturley	M0IJS	Rugby
Ralph Bird	G4ALY	Saltash

Paul Archer	M0PJA	Sheffield
David Crump	G8GKQ	Southampton
Barry Shane	G1JOL	Spalding
Grant Mackintosh	2E0KUW	St Austell
Keith Bonney	G0KTD	St Austell
Anthony Kerr	M1BWS	Still Helens
Mark Longson	G0NMY	Stoke On Trent.
Philip Morris	M0ZPG	Sutton
Dennis Fitch	G8IMN	Sutton Coldfield
John Alexander	M6JAX	Telford
Mike Isherwood	G4VSS	Warrington
Ray Davis	M0DTM	Wolverhampton
Gavin Nesbitt	M1BXF	Woodditton

United States

Roland Hoffman	KC6JPG	Alta Loma
Lawrence K Nelson	KC0PYX	Boulder
Jim Andrews	KH6HTV	Boulder
Donald Apte	AA6TV	Broomfield
Byron Beck	N6UOB	Campbell
Farrell Winder	W8ZCF	Cincinnati
Bob Rector	W8RWR	Columbus
Dennis Belles	WA7DRO	Lake Oswego
William Brown	WB8ELK	Madison
Scott Chapman	K4KDR	Montpelier
William Heiden	W8URI	Mount Gilead
Carl Sorensen	NB7C	Payette
Dale Elshoff	WB8CJW	Powell
David Sage	KI6UXO	Rancho Cucamonga
Norman Thorn	K6UU	Redondo Beach
Richard Diehl	KJ6RNL	San Jose
Ben Carlucci	W2NYC	San Jose
Joe Barcelona	WB6RIY	San Jose
Michael Maronta	KC6YNQ	Seal Veach
Gary Ashkenazy	AF7M	Tucson



► The inside of the Portsdown Express transmitter built by G8EOJ



Contest and Activity Day News

Clive Reynolds G3GJA

With Dave G8GKQ changing roles to become your new chairman, I have taken on responsibilities for contests and activity days.

The primary purpose of the events is to promote and focus ATV operation. A secondary, but none the less important purpose, is that it helps to provide documentable evidence that we are using the frequencies allocated to us; and that benefits all amateurs in our struggle to retain spectrum or gain new bands. ATV has been particularly successful in this with the NoV bands at 71 and 146.5MHz.

At CAT 18 I gave a short presentation on the IARU ATV contest in June and requested some feedback on what members would like to see organised for forthcoming ATV activity events. Suggestions (and criticisms!) are still welcome and should be sent to contests@batc.tv.

Following the feedback received so far, we are organising a couple of new contests:

The Christmas and New Year holiday is not that far off and it seems to be a good opportunity to revive the ATV repeater contest. So starting on Boxing Day (26th December) and running through to 23:59 UTC on New Year's Day we are organising the BATC Winter ATV Repeater Contest. This will run over the 7 days when most people are able to get in the shack and will have a simplified structure with scoring based solely on distance from the transmitting station to the repeater at one point per kilometre. You are allowed to claim one QSO on each band with every station per day worked, so if your repeater has two inputs on different bands you can work the same station twice on the same day if you use both bands.

This system will also allow receiving via a stream feed to be a valid contact that will generate points for the transmitting station and don't forget that the next day you can get valid points from working the same stations again. A certificate will be awarded for the station with most points and the runner up plus we will be awarding a £50 prize to the repeater group who saw the most claimed contacts through their repeater. See the BATC activity web page for contest rules and more details.

Also I am looking at running activity contests that concentrate on specific bands so that those who like to operate portable are not obliged to take equipment for every possible band. Looking at the calendar it seems that March and October would fit well either side of the June IARU ATV contest so starting this month we will be running a Low band activity weekend focusing on 71 and 146MHz. In March a weekend will be dedicated to the High Bands including 5665MHz and above and for this weekend, there will be an award for the winning stations on 5665MHz. Dates are the weekend of the 20th - 21st October 2018 and the 9th - 10th March 2019.

Other ideas include monthly activity weekends and possibly weekday activity evenings lasting a couple of hours or so but have not been set in stone yet as I need feedback on what you want organised to promote ATV activity, so do please let me know using contests@batc.tv

Activity reports

Recent activity reports include news that on September 14th Shaun G8VPG and G4BVK have set a new record for 71MHz DATV.



The 136Km path was between G4BVK/P at Cleeve Hill, Cheltenham (IO81XW90) and G8VPG/P at Dunkery Beacon, Exmoor (IO81FD19QU). Both stations were



running about 20W into 3 element beams, using 333ks/s with H265 codec from the DATVexpress with superb picture quality and consistent lock throughout each over. G4BVK pictures peaked at 12dB MER with G8VPG and the reverse report was a 22dB MER. Shaun was able to reduce power to 2W and still maintain 7-8dB MER locked pictures with him.

Also reported on the forum is news that the Cumbria team have been out on 5.6Ghz again and this time to work some newcomers to 6cms but experienced ATV'ers Dave G3ZGZ, Ted G4MXR and Bob G1EPL.



P5 signals both ways with all stations, over the 40km path from Blackpool to Ulverston Cumbria and Nick G0HIK says we are always happy to work new stations and try new paths. So why not give 5.6GHz a try – you can have a lot of fun for under £100!! 📡

Activity calendar

1200 UTC 20 Oct – 1800 UTC 21 Oct '18

1200 UTC 17 Nov – 1800 UTC 18 Nov '18

1200 UTC 8 Dec – 1800 UTC 9 Dec '18

0001 UTC 26 Dec '18 – 2359 UTC 1 Jan '19

1200 UTC 12 Jan – 1800 UTC 13 Jan '19

1200 UTC 9 Feb – 1800 UTC 10 Feb '19

1200 UTC 9 March – 1800 UTC 10 March '19

1200 UTC 6 April - 1800 UTC 7 April '19

1200 UTC 4 May - 1800 UTC 5 May '19

1200 UTC 8 June - 1800 UTC 9 June '19

1200 UTC 13 July – 1800 UTC 14 July '19

1200 UTC 10 Aug - 1800 UTC 11 Aug '19

1200 UTC 14 Sept – 1200 UTC 15 Sept '19

Low Band ATV Activity Weekend – 71 and 146MHz

ATV Activity Weekend

ATV Activity Weekend

BATC Winter Repeater Contest

ATV Activity Weekend

ATV Activity Weekend

High band Activity weekend - ATV 5.6 GHz and Above

ATV Activity Weekend

ATV Activity Weekend

IARU International ATV Contest

ATV Activity Weekend

ATV Activity Weekend

ATV Activity Weekend



Touchscreen control of the DATV-Express – part 2

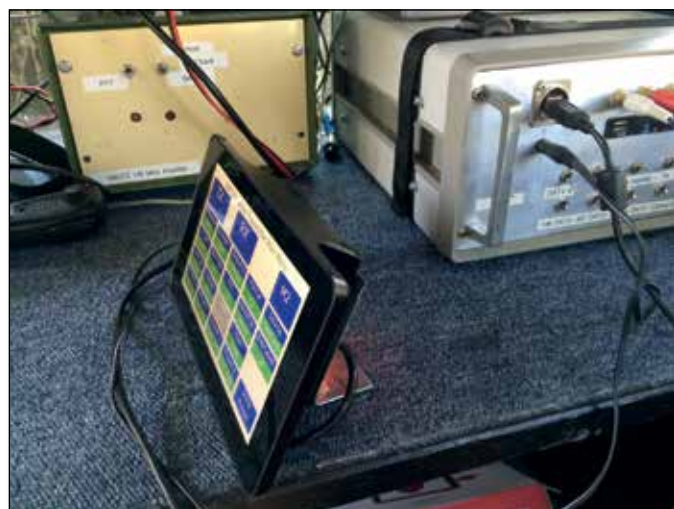
Noel Matthews G8GTZ

CQ-TV 259 page 44 described how the Portsdown can control a DATV-Express board over the USB port so you get the benefits of the Portsdown UI and video coding quality plus the excellent RF performance of the Express board.

What I did not cover in that article is the fact that you can also use the Portsdown 4 or 8 way RF switch on the output of the Express board and the PTT decode boards to provide full band switching of power amplifiers and transverters.



The 8 way RF switch and PTT decoder boards can either be driven directly off the Rpi GPIO pins, as in the original Portsdown design or from the DATV-Express GPIO pins – I used this method as my Rpi is mounted in a separate housing (see below) and it retains the capability to use the DATV-Express PC software with the system.



To use the DATV-Express GPIO pins you need to set the Portsdown band settings (under menu 3) to toggle the correct DATV-Express port for the band in use. The table below shows how I configured my system.

The use of the Portsdown to control the DATV-Express offers DATV-Express owners the opportunity to build a DATV transmit system which combines the superb RF performance of the DATV-Express with all the features, including touch screen control, of the Portsdown system.

This is particularly true when used with the 7" touch screen from Element14 mounted in a standalone housing from <https://www.modmypi.com/> This combination, with its large screen, is a very flexible system, and the Portsdown 8 band presets, with the ability to set separate RF levels for each band makes it very easy to use particularly when out portable. 📡

Band	o/p name	8 way switch o/p	Express ports			
			A	B	C	D
70	VHF low	1	0	0	0	1
146	VHF	2	1	0	0	0
432	UHF	3	0	1	0	0
1250	23cms	4	1	1	0	0
2400	13cms	5	0	0	1	0
9cms	UHF trans 1	6	1	0	1	0
3cms	UHF trans 2	6	0	1	1	0
24 GHz = 800mw	VHF trans 2	7	0	1	1	0
76Ghz = 100mw	VHF trans 2	7	0	1	1	0
	Trans 3	8	1	1	1	0
	Trans 4	8	1	1	1	1

CAT18 award presentations and prizes

Rob Burn G8NXG



It is a tradition that part of the bi-annual meeting at each CAT features a section devoted to the presentation of awards. The criteria for each award tends to vary each time, to mirror trends and ATV activity.

Presentation of this years awards was made by Graham Shirville, G3VZV, President of the BATC.

In 1983 the Grant Dixon Award was created to mark the retirement of Grant Dixon G8CGK from the BATC Committee, having served more than 30 years in office.

Although the award was originally intended to encourage the publication of articles for CQ-TV, in recent years it has been awarded to individuals or project teams who are judged by the BATC committee to have contributed significantly to the development of the ATV community.



It is normally presented at the BGM and this year the Committee was unanimous in proposing that the award should go to Dave Crump G8GKQ for his outstanding contribution to the development of DATV and RB-TV through the Portsdown project.

Amongst those stations which achieved winning positions in the transmitting contests over the year, three had been identified as BATC Awards winners. These are:

1. A £50 Amazon Voucher to the winner of the BATC 146 MHz Contest:

This was won by a Committee member (Dave G8GKQ) with the Chairman second. Sadly, as committee members they are illegible to be presented with the award!

2. A £50 Amazon Voucher to each station in the Best DX 2-way 5.6 GHz Contact
G3NWR Wirral ARS (Brian G4EWJ) and Tony G4CBW achieved the best DX 2-way 5.6 GHz Contact at 154 km. and so they were awarded with a £50 Amazon Voucher each.



► Brian G4EWJ receives the prize from Graham G3VZV on behalf of the Wirral ARS

3. A £50 Amazon Voucher to be awarded to the transmitting station using a Portsdown system, received at the furthest distance on any band.
The best Portsdown DX by a non-Committee Member was Neil G4LDR for a contact with G8GTZ at 64 km on 24 GHz. Notably, this was Neil's first contest and he also had a Portsdown contact on 76 GHz.

CAT18 also featured a construction competition where items under consideration were examined and voted for by a panel drawn from members of the committee.



The first prize went to David Harbour G0EID for his mini RB-TV Mod.



The second prize was won by Gareth Evans G4XAT for his 3D print production of mouldings to mount the 3.5 inch display screen for the Portsdown and end-caps for the MiniTiouner housing.



In other news certificates were presented to the 2018 contest winners, details elsewhere in this edition of CQ-TV.

Congratulations to all prize winners and well done to all who contributed to the contests. 📺



BATC Test Equipment

Dave Crump G8GKQ



Thanks go to Ted G3XUX for donating these really useful pieces of equipment to Phil M0DNY for safe keeping and use within the BATC. The equipment is available on loan for future test/build/measurement events; please contact Phil or I if you wish to borrow one or both of the units. Think about how the units can be transported from Southampton to your venue and returned (although compact, they are not light), and who has the expertise to make sure that they are used properly. In between club events they are being put to good use by Phil. The sweep is of an Uputronics HABamp Filtered 70 cm preamp (at 5 MHz/division) 📡

<https://store.uputronics.com/files/HAB-FPA434.pdf>.



Some of you will have noticed the Hewlett Packard Spectrum Analyser and Tracking Generator on the Portsdown Clinic test bench at CAT 18. This HP8558B analyser with its matching HP8444A tracking generator are perfect for DATV measurements up to 1500 MHz and will allow Portsdown transmitters, filters, PAs and preamps to be tested and measured at similar events in future.



Microwave roundtable construction competition winners

A great way of getting free publicity for the Portsdown project and ATV generally is to submit your latest creation in to your local radio club construction competition or better still to enter a regional UK microwave group roundtable construction completion.

Dave G8GKQ did this and won the regional heat at the Harwell Round Table in June and Jen G4HIZ recently entered the Crawley roundtable heat and won a magnificent trophy. Presumably they will go head to head in the finals at Martlesham next year! 📡





A Handy Signal Generator for 10GHz

(and other frequencies)

J. Easdown G4HIZ

One of the factors not often appreciated about the ADF4351 is the harmonic content of the RF output. Essentially, it tries to be a square-wave, although when you get to the higher frequencies, the harmonics are starting to tail-off a bit. The clone evaluation boards available online which use FR4 (fibreglass) substrates don't help the higher frequencies.

In order to see what I could get at 10GHz, I looked at the third harmonic output of a suitable carrier. The levels that I found were as below:

Fundamental frequency (3456.03333MHz)	4dBm
2nd harmonic (6912.06666MHz)	-28dBm
3rd harmonic (10368.1MHz)	-26dBm

Higher harmonics not seen.

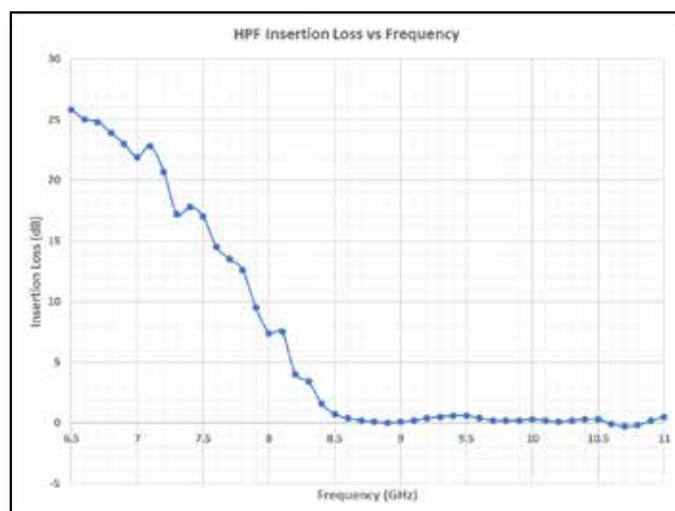
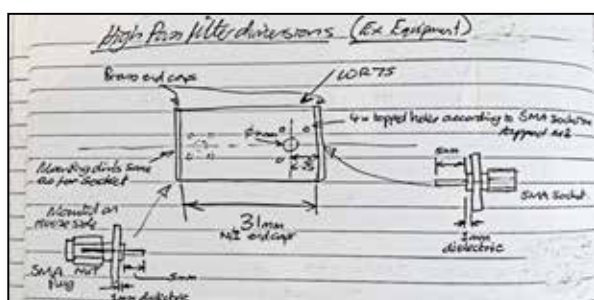
I thought that I may try to increase the 10GHz output a little and placed a dual (back to back) Schottky diode across the RF output of the board, type BAT54S.

The effect of this was to change the levels to: fundamental 0dBm, 2nd harmonic -22dBm, 3rd harmonic -24dBm. I decided to keep this arrangement due to the slight increase at 10GHz, which for a marker source can be considered as very high in any case.

To see what the harmonic content was for a lower frequency, the board was programmed to produce 100MHz output and significant harmonics could be seen to more than 8GHz!

Returning to 10GHz, the next thought was, can a High Pass Filter help clean up the output a bit? I had available a very nice (and simple) ex-equipment HPF made from a short section of WR75, with input/output coupling via SMAs. The measured frequency response of the filter is shown at the top of the next column.

Using this filter, the output levels were: fundamental -58dBm, 2nd harmonic -39dBm, 3rd harmonic -26dBm. It was decided that this was a useful addition. See below for a sketch of the HPF construction.



The next thing to consider was the on-board frequency reference. I decided to change this for a high stability 10MHz OCXO with frequency adjustment capability. This would help to get a reliable and calibratable output frequency. The unit chosen was the IQD LFTVXO009912 (obtained from Farnell), with a claimed stability of +/- 0.5ppm, which can be used as a drop-in replacement for the original. After a 2 to 3 minute warm-up, the drift at 10GHz was hardly noticeable. To calibrate the frequency, I generated a 3456MHz output and measured the frequency using a Rubidium locked counter and adjusted the reference accordingly.

The other thing that I considered was the PLL loop filter, having designed a number of PLLs. Bearing in mind that the original AD evaluation board was probably designed to suit a particular requirement, I modified the filter such that a wider range of loop operating conditions could be tried by altering the Phase Detector output current. This current was programmable over a wide range for the ADF4351 and directly influences the loop bandwidth. Now, messing about with surface mount resistors and capacitors is not everybody's idea of fun and it was not strictly necessary, but it did provide a useful degree of extra tweaking capability. By adjusting the loop bandwidth, it was possible to reduce the impact of spurs (unwanted spurious outputs), whilst maintaining the best possible Phase Noise.

Having mentioned the word spurs, it is worth pointing out that the ADF4351 has two fundamental operating PLL modes: Integer-N and Fractional N. In simple terms, a Fractional-N PLL changes the frequency divider value part way through a division, resulting in a fractional division.

This has the useful attribute of allowing smaller frequency steps to be obtained than the Phase Detector input frequency, whereas for an Integer-N PLL, steps are limited to this frequency. For example, a 1MHz phase detector frequency would allow 1MHz steps in an integer-N PLL, but 244Hz steps for a Fractional-N PLL such as the ADF4351. Great, you may say, but the downside is that a Fractional-N PLL can produce intrusive frequency spurs. A trick can be employed to try and reduce the spur amplitudes (Low Spur Mode) but this is not completely effective and can significantly increase the Phase Noise near the carrier.

It can be seen that there is plenty of scope for experimentation with Fractional/Integer-N PLLs, to trade-off the purity of the output versus the frequency steps. In this case, the decision was made to use as large a step as possible, with the possibility of smaller steps with degraded spur performance if required.

In the end, as happens with many projects of this type, it grew quickly! So from a requirement for a simple marker at 10GHz, it developed into a full-blown signal generator covering roughly 35MHz to 13.2GHz. The basic ADF4351 board was incorporated into a small case with a PIC16F690 microcontroller, which had In-Circuit Serial Programming brought out to a connector, thus allowing the PIC to be reprogrammed at any time. An on-board rechargeable NiMH battery was used together with a small DC/DC converter to reduce the effective current demand of the synthesiser (around 120mA) as presented to the battery (down to about 60mA, including PIC). A switch allows the selection of pre-set frequencies covering 70MHz to 10GHz. In addition, an RS232 interface was provided for future remote-control development. And lastly, all available spare port pins of the PIC were brought out via a connector to allow simple interfacing of control/display, with the aim to produce variability of frequency. For RF output, one output of the board was used for fundamental output, whereas the other was fed via the HPF and used according to the filter characteristic, mainly for 10GHz.

Some photos of the unit development and results can be seen below.

Finally, the pot for frequency reference adjustment was panel mounted. The SMA connector has the BAT54S mounted directly onto it. The coax connection for the other RF output did not seem to unduly affect the output levels.

Conclusion

The completed Signal Generator provided useful outputs for markers at amateur band frequencies from 70MHz to 10GHz. It also provided a useful test-bed for experimentation with Fractional/Integer-N PLL synthesisers.



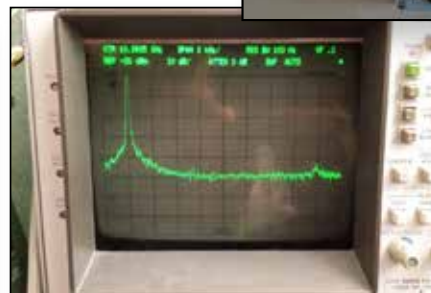
► Prior to final integration.

► Completed Signal Generator, rear end view.

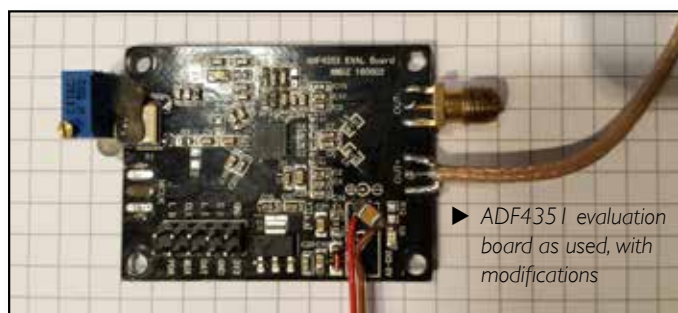
► In use in hand-held mode, using a WA5VJB 2-11GHz antenna for 10GHz output.



► In use with control/display unit attached.



► Typical 10GHz output (using a Fractional-N PLL). The bump on the right is a smoothed spur.



► ADF4351 evaluation board as used, with modifications

Es'Hail-2 launching soon!

Noel Matthews, G8GTZ



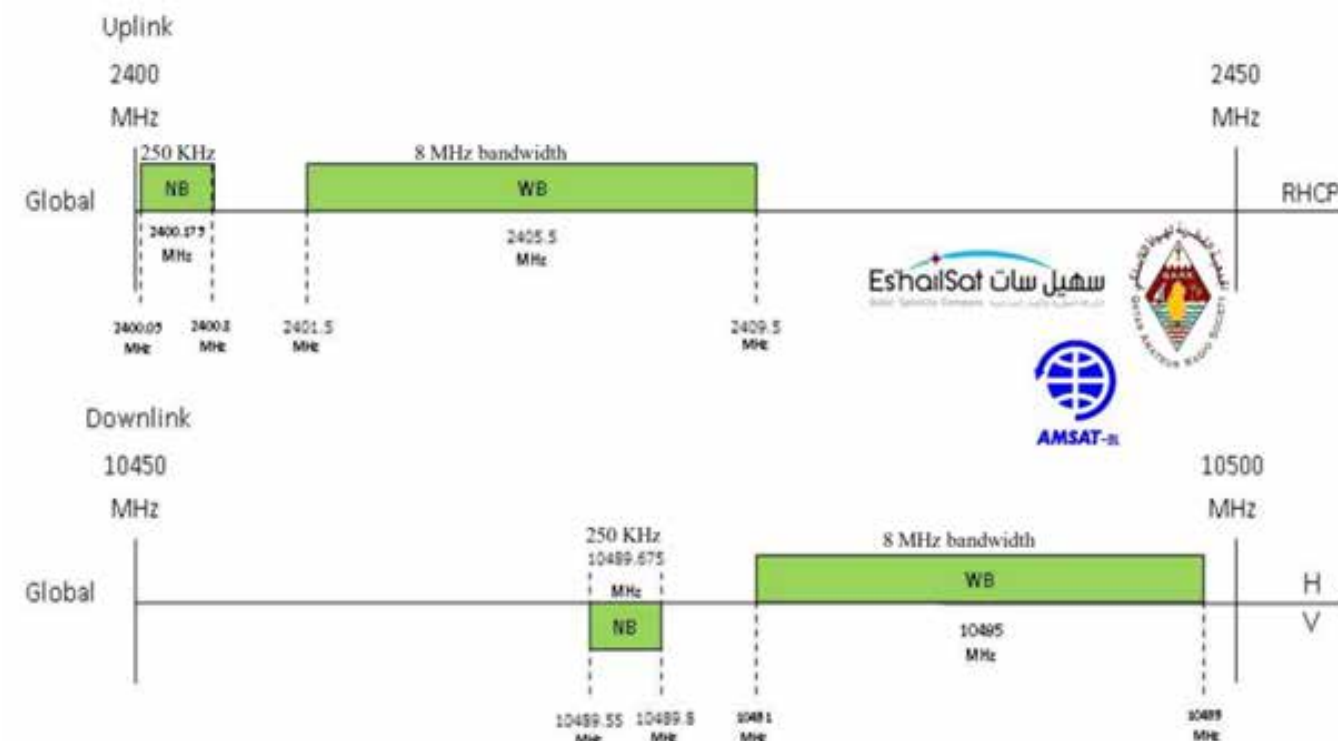
Es'hail-2 is a Broadcast Transponder Satellite owned by the Es'hailSat Qatar Satellite Company, due to be launched to Geostationary orbit at 26° East of South with 2 dedicated amateur radio transponders. One transponder, which is 250KHz wide, will be used for narrow band analogue voice and CW communications and the second transponder, which is 8MHz wide is intended for digital ATV communications.

The coverage of this unique spacecraft will be constrained by the radiation pattern of the antennas being used for the uplink and downlink. We understand that these are horns and that they have been designed to have "global" coverage. The map shows the potential coverage down to 0 degrees of elevation for the ground station antenna.

The two transponders will provide 24/7 coverage for both narrow band and wide band signals.

This chart shows the two transponders, their passbands and uplink and downlink polarisations. Note that, unlike the linear transponders on most other amateur satellites, these transponders are not inverting.

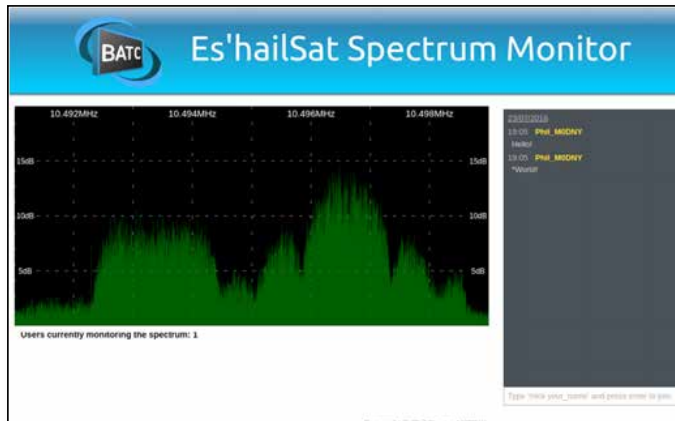
BATC has been working with AMSAT DL and AMSAT UK for almost two years and as well as helping to prepare the wideband transponder band plan (see below) we have also undertaken to provide a web SDR and spectrum monitor facilities based at Goonhilly and we are most grateful to Goonhilly Earth Station Ltd for their help and support.



Xpdr	U/L FREQUENCY (MHz)				D/L FREQUENCY (MHz)				LO	BW
No	Pol	Begin	Center	End	Pol	Begin	Center	End	(MHz)	(MHz)
NB	RHCP	2400.05	2400.175	2400.3	V	10489.55	10489.675	10489.8	8089.5	0.25
WB	RHCP	2401.5	2405.5	2409.5	H	10491	10495	10499	8089.5	8

Es'hail-2 Narrowband Transponder – web SDR

The narrowband transponder is intended for conventional analogue and narrowband digital signals and it will be possible to listen to it by the use of a web SDR system. This web SDR is being established at the Goonhilly Earth Station in Cornwall UK and provided by the BATC and AMSAT-UK. The url for this facility will be announced before operations commence.



Es'hail-2 Wideband Transponder – Coordination

Due to the very large number of variations of transmission parameters, it is essential that all users notify their transmission parameters on the co-ordination chat room page that has been established by AMSAT-UK and the BATC. This facility, and the spectrum monitor system, is also being established at the Goonhilly Earth Station in Cornwall UK. The url for this facility will also be announced before operations commence.

Timescales

At the time of writing this report the exact launch date for this unique spacecraft has not yet been confirmed. The latest news that has been published says 4th quarter 2018 so it could be really quite soon.

Although the launch is scheduled for later this year, we will have to continue to be patient for a period after launch for the formal commissioning process to be completed. Unlike the usual rapid commission undertaken by amateur CubeSats, this spacecraft will be carefully tested after launch before normal operations commence. It is the usual practise for this commissioning process to be undertaken away from the final location so do not expect to see/hear signals from 26 degrees east just yet! 📡

The future of CAT



- BATC will continue to have a national convention with the BGM every 2 years
- Should we make alternate year events several smaller regional gatherings?
- Organised by the people in the region and supported by BATC
 - North East / Yorkshire / Lincs?
 - North West / Manchester / Wirral?
 - Midlands / Telford?
 - South West / Bristol?
- Will help to build ATV communities around the country
- Thoughts / ideas / volunteers to lead?



ATV Workshop in Shropshire

Heather Lomond M0HMO



On the 4th and 5th of August, 14 of us got together at Eaton Manor, Shropshire, to try to get our ATV equipment sorted and on-air. Dave (G8GKQ) and Noel (G8GTZ) from the BATC came up to help us out and added their extensive skills and test equipment to the kit and expertise we had already gathered together. Saturday proved very effective with multiple projects springing into life and then on Sunday most of us drove up to the top of the Long Mynd (a local high spot) and tested out our, now working, ATV projects as part of the regular ATV event day.

We set up the event because so many people in the area had made good progress with their ATV projects (Minitouners, Portsdowns, 5.6GHz FM drone systems and so on) but few had got everything working. Mostly it was due to a lack of test facilities and knowledge so having Dave and Noel on hand was exactly what was needed. Many of the enthusiasts who turned up brought some test equipment with them so we had spectrum analysers, scopes, meters, test card generators as well as Dave's Portsdown test rig and, of course, working equipment to test against.

We kicked off Saturday with a couple of presentations from Dave and Noel about how things were getting on with Portsdown and other ATV development, and then jumped in at the deep end with a queue forming for our 'Experts' to look at hardware. By the end of the day we had 3 Portsdowns alive and well, 2 working minitouners modified to the latest spec, 1 Minitouner OLED display sorted and working, a 5.6GHz FMATV transceiver up and running, at least 1 monitor tested and tweaked, some amplifiers measured and two people even found time to build minitouners from scratch.

As is often the way, odd components were needed, either to fill gaps for things people couldn't get or to replace ones that had been broken for whatever reason. Thanks to the great generosity of some members everyone managed to get the components they needed to get their projects sorted.

Saturday night saw us in a local restaurant for a decent meal followed by a pint or two in another local establishment all mixed in with good conversations and tales of how big everyone's DX was and the ones that got away!

Sunday started with a drive up to the Long Mynd where we set up a number of stations. Noel had his full spectrum setup going in no time and was making ATV QSOs on all sorts of bands. Others followed and I think most of the people who came up the hill with kit managed to get a contact out of it in some form. The highlight for me was Peter Holman's newly assembled 5.6GHz rig. His first received ATV image was from a site over 90Km away.

A big thank you goes out to John Cariss (of Eaton Manor Estates) who allowed us to use his Banqueting Hall for free and also laid on a great cooked lunch as well as teas, coffees and biscuits throughout Saturday and also to the numerous guys in far away places who came out to make QSOs with us on the Sunday.

We plan to run the next ATV workshop at the same location (Eaton Manor Estates, Shropshire) on the weekend of December 8th/9th 2018. This should coincide with the December activity weekend for those adventurous enough to go up one of the local hills but we will also have a test range available on site for more short range testing. 📡

Heather (M0HMO)
heather@myorangedragon.com





Portsdown Newsletter

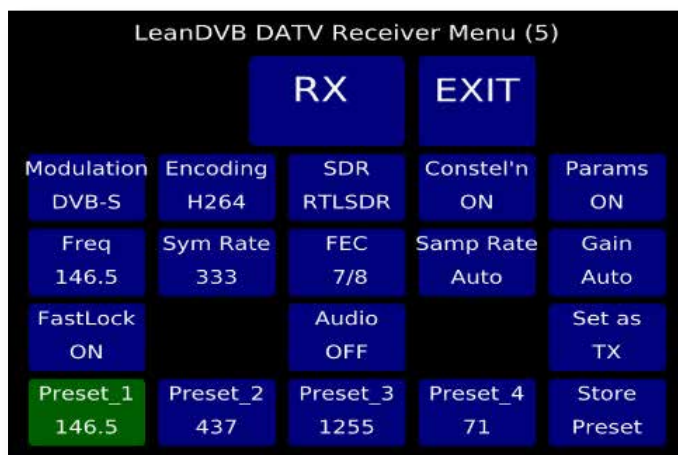
Dave Crump, G8GKQ

New Features

New features for the Portsdown are described on the BATC Wiki as they are made available. Here are brief descriptions of some of the latest features:

- ▶ LeanDVB Receiver Enhancements and Menu
- ▶ Receive LO Generation Capability (for 71 MHz)
- ▶ BATC Steamer Display
- ▶ Stream Receiver Function for Repeater use
- ▶ Touchscreen-selectable Streamer Outputs
- ▶ Improvements to the RTL-FM Receiver
- ▶ Reboot/shutdown fix

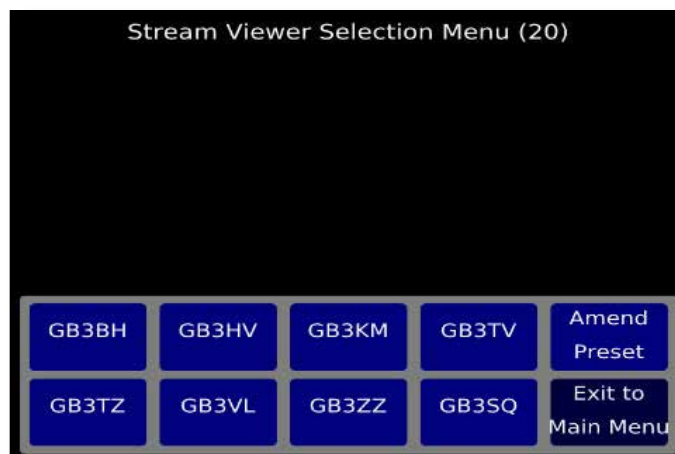
The LeanDVB basic DATV receiver now brings up a dedicated menu when it is selected from Menu 1. This menu enables the user to select settings independent of the transmitter settings and to store and recall presets. It also supports MPEG-2 reception if the user has purchased the £2.40 decoder licence. The LeanDVB receiver is not as good as MiniTioune (needing 6 - 9 dB more signal) as it does not implement Viterbi error correction.



Some 71 MHz receive up-converter boards need a Local Oscillator signal. The Portsdown can be set to generate this signal using the ADF4351 VCO (it has 2 outputs). Simply select "Set RX LOs" from Menu 3, and then set the frequency you want against the band that you want it active for.

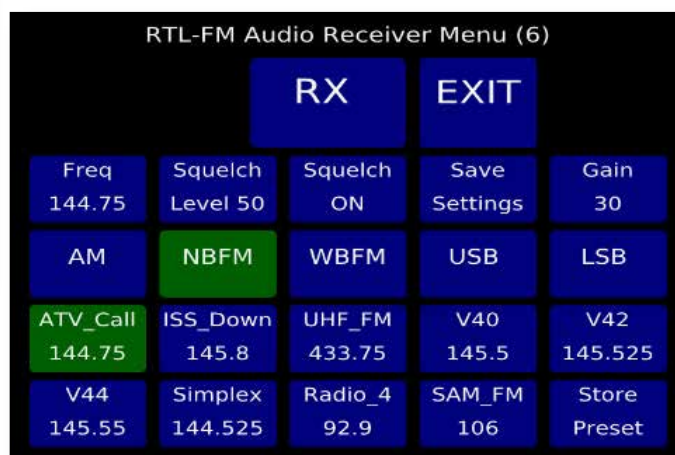
You can now use the Portsdown to watch streams from the BATC Streamer. Select "Stream Viewer" from Menu 2 and you will get a menu of 8 of the more active streams. You can change these presets to streams of your choice.

This capability has been extended to work as a stand-alone stream receiver that can trigger a repeater to transmit when it receives a stream. See the Wiki for full details.



Now that some repeaters have stream inputs, there is a requirement to switch between streaming to a personal stream and streaming to a repeater. There is a new "Set Stream Outputs" menu available on Menu 3 to allow stream output set-up and switching.

The RTL-FM receiver previously had some serious bugs. In particular, the gain was always set at zero, making it very insensitive. The new RTL-FM receiver menu allows the gain to be set for each preset and makes this receiver useful for monitoring NBFM, WBFM or AM channels.



Some of you may have noticed that your Portsdown did not reboot or shutdown properly. This was because of an outdated device tree file that was not compatible with Stretch, and also some problems with de-allocating swap space. Hopefully both of these issues have been cured in recent updates.

End of Support for the old Raspbian Jessie Operating System

The Raspbian Jessie operating system was superseded by Raspbian Stretch over a year ago now, and Portsdown builds based Raspbian Stretch have been available for over 6 months. It is becoming increasingly difficult to support both operating systems, so the recent 201809151 update to Portsdown Jessie will be the last update I publish for this old operating system.

If your system is based on Jessie (look at the info page available from Menu 2 – if it doesn't say that it is Stretch or there is no Info page, then you are on Jessie), you have 3 options:

Option 1: You can do nothing. Your Portsdown will continue to work as it always has. You can think of this as bolting the lid on a piece of hardware, and not making any more improvements.

Option 2: You can update to the final Jessie version and then not upgrade any more. You will get almost all of the current Portsdown functionality (frozen as at September 2018), but no future improvements. Think of this as making the latest modifications to your equipment and then bolting the lid on.

Option 3: You can overwrite your SD Card with the Stretch operating system, and then rebuild the Portsdown (or simply replace the SD Card with a new one from the BATC Shop). This will bring you the latest features and allow you to take advantage of future upgrades. Think of this as making the latest modifications to your equipment and then leaving the lid half open for new modifications.

All cards sold by the BATC Shop since 3 April 2018 are loaded with the new Stretch operating system; if you have an older card and you purchase a new card, I am prepared to reprogram your old card with Stretch for you if you send it to me with a stamped addressed envelope – please contact me by e-mail for details.

Programming Languages for the Portsdown

There has been some discussion about the programming languages used in the Portsdown. As it is a collection of other people's programs, it is a real mixture.

Most features are started and stopped by BASH scripts; the touchscreen program and the core DATV software are written in C. Some of the H264 coding uses C++ and the Spectrum viewer uses Python. You can examine most of the source code on the BATC GitHub page:

<https://github.com/BritishAmateurTelevisionClub/portsdown>.

If you have an idea for a new feature for the Portsdown, and have a proof of concept running on a Raspberry Pi, I am more than happy to try to integrate it with the rest of the system. As long as it will run on Stretch Lite and the normal Portsdown hardware, I would welcome new features.

Hardware Options

I was really impressed by G8EOJ's Portsdown Express that I saw at CAT 18. He has used the 7 inch screen and a Portsdown to control a DATV Express board and then used the Portsdown output switching circuitry to provide 4 outputs. A really great idea. (See separate article on this subject by Noel Matthews on Page 9 in this edition - Ed)



Future Work

I have a long list of minor modifications to make and would welcome suggestions for more, but the major work I hope to undertake in the next 3 months includes:

- ▶ Improvement of H264 picture quality at low symbol rates
- ▶ Investigating the potential of the Lime SDR with the Portsdown.
- ▶ Overhauling the Signal Generator to be capable of driving the ADF5355 to 13 GHz.
- ▶ Trying to make an X-Y display using the MCP3002 A-D converter.
- ▶ Moving more set-up functions from the Console to the touchscreen.

As I do all this work, I have one request – please use your Portsdown and get on the air! 📺



DATV over optical – an introduction

Bernie Wright G4HJW

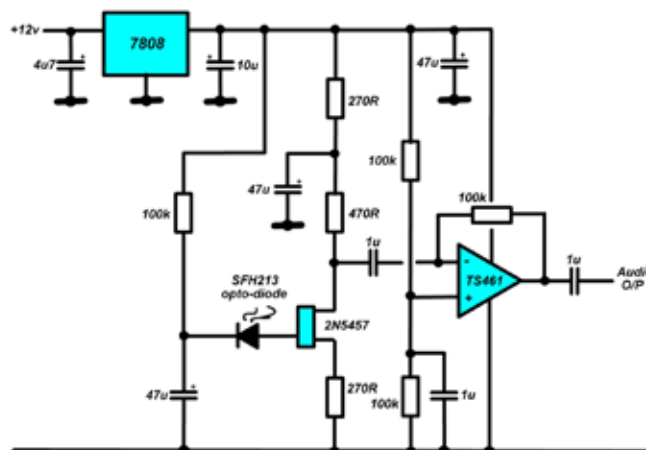
Having played with audio-over-optical links for the last five years or so, and then more recently being drawn into the delights of all things MiniTioune, I suppose bringing both projects together should have been an obvious next step. Hearing of Rob M0DTS's success in sending analogue TV over an 11km path stirred my interest, but it was only when Brian G4EWJ suggested DATV over optical earlier in the year that the idea finally took hold.

Not having any real background knowledge of analogue TV, let alone DATV, could be seen as a slight disadvantage at this point, but it has been enormous fun just 'doing stuff', without any great regard to the theory - and along the way, it has been the resulting errors that have provided the largest insights. Work to date represents only a first run through, but the resulting 30km estimated range is quite encouraging, particularly as only a modest 1.5 watt transmit power was in use for the tests.

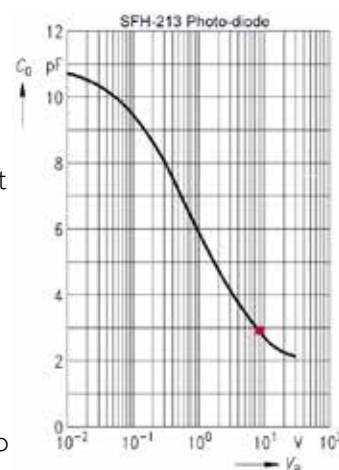
By way of an introduction, this opening article of two describes the optical world as it relates to long distance audio only optical communications, since this may be unfamiliar to most BATC members. The second article will get to the heart of the matter and cover the changes required to cope with the higher bandwidth required for DATV and the experience gained by using both the Portsdown DATV generator and MiniTioune decoder working within an optical link environment.

Facets of an audio optical link

Simple baseband AM systems can work remarkably well at audio frequencies. For instance, night time operation of a 10mm red LED driven at 200mA (that's about 400mW input power) placed in front of an A4 size Fresnel lens, can produce a good readable signal at 60km range when using something like the simple receiver circuit shown, assuming it is similarly preceded by a Fresnel lens of the sort available from places like WH Smith, such lenses being primarily marketed as page magnifiers. To put this level of performance into perspective, a noisy but obvious 1 kHz tone can still be heard when with a red LED source, the transmitter is no longer visible to the naked eye. To achieve this sensitivity, care is needed to keep the opto-diode as lightly loaded as possible.

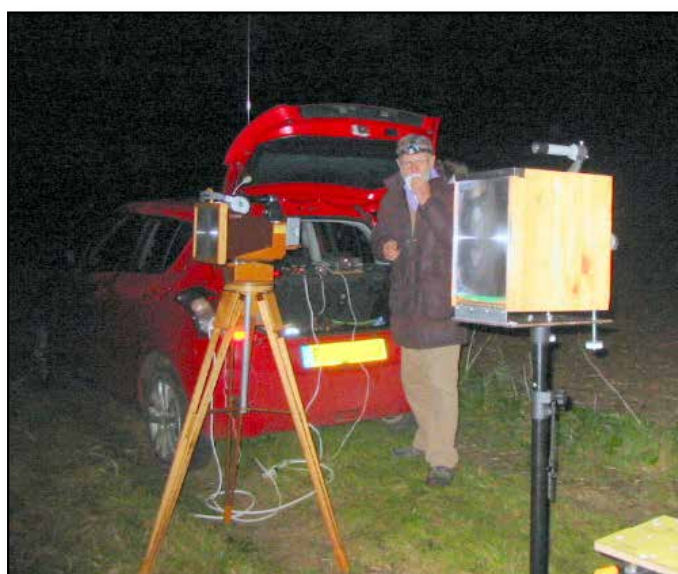


► Audio optical rx with graph showing opto-diode self capacitance characteristic.



The opto-diode in this circuit is connected to the gate of the FET buffer without any other shunt components, apart from the inherent photo-diode and FET gate to source self capacitances, yet even these are enough to reduce the gain above 1 kHz.

By reverse biasing the opto-diode to 8V, reduction of the self capacitance from 10pF down to 3pF is achieved and helps limit this effect. Estimation of equivalent operating shunt resistance at 1 kHz (by shunting the gate further with extra resistance and measuring the resulting drop in gain) is between 30 and 40 Megohms, so care also has



► Two light-boxes that use A4 size Fresnel lenses. One was very well made by Richard GORPH and the other is mine – both work well.

to be taken to avoid things like mains hum pick-up, and less obviously, microphonics caused by minute changes of interconnection capacitance.

Despite the receive reduction in gain above 1 kHz, it would be wrong to imply that operation above baseband audio frequencies is never encountered. For one thing, there is often a lot of optical pollution at 50 Hz plus harmonics and associated gunge up to several kHz, so operating in sub-carrier mode (SSB or FM) at say 10 kHz can be beneficial. A portable HF transceiver feeding a simple transverter provides a convenient way of achieving this.



► Tx LEDs
Left: 400mW 10mm ebay
(alongside 5mm SFH213)
photo-diode
Right: Golden Dragon
and Phlatlight



High power LEDs from the 1.5W Osram 'Golden Dragon' range and 24W Luminous Devices 'Phlatlight' series are popular transmit LED choices, the latter having appeared on the surplus market as projector 'pulls'. Red (around 620nm) is a common operating wavelength, due to the lower atmospheric absorption characteristic in that portion of the visible spectrum, though IR has been used as well. That the former is visible to the human eye can be both an advantage and disadvantage depending on whether or not you are bothered about drawing attention to yourself when operating out portable, although of course it does make links easier to set up. Daytime operation is possible over reduced range, and this reduction can be minimised by using optical filters in front of the receive head, though really narrow bandpass filters are quite expensive.

In the case of the 1.5W Golden Dragon LED, a mono audio amplifier module using something like a TDA2050, available cheaply as a built up item via ebay, is all that is required to AM modulate the LED. With this implementation, the output DC blocking capacitor would be removed so that the ICs half rail standing voltage was available to bias the LED, which would be fed via a resistor to set the appropriate quiescent current.

Optics

The situation with optics is less critical for optical links than it is for TV use. Focusing errors really only effect

efficiency, since we are looking primarily for maximum energy collection. There is no equivalent subjective horror of seeing an out-of-focus 2D image. Indeed, when setting up a link, you may deliberately de-focus the tx optics in order to widen the achievable sub 1 degree beamwidth, thus easing the initial lining-up difficulty. In other respects, most optics considerations would be quite familiar to any BATC operator.

A likely starting point for the optics will be the acquisition of a Fresnel lens. The readily available, low cost plastic examples have a typical focal length of 300mm. Assuming

a circular or square LED (or photo-diode) die shape, the simplest implementation will produce under-illumination of the lens long side whenever the shorter side is fully, but not over illuminated, in the case of a rectangular lens. Simple maths that even I can manage translates this geometry to an optimal illumination angle of ± 18 degrees.

Most power LEDs have beamwidths of about ± 60 degrees, but it is

interesting to note that clear-potted LEDs of the 5, 8 or 10mm diameter half-domed variety are available with beamwidths of a near ideal ± 20 degrees, as are some photo-diodes, and that these can be usefully used with A4 Fresnel lenses directly, ie, with no further optics, which is why the 400mW 10mm LED mentioned earlier makes for a simple overall low cost transmitter (or better still, transceiver, since some LEDs can also be used as sensitive photo-diodes – but that's another story).

To reduce the beamwidth of a wide angle LED, a bullseye lens of suitable dimensions can be placed in front of its output. In all cases, the smaller the LED die area, the tighter will be the ultimate image size that it can be attained and, of course, the higher power LEDs will tend to have larger die areas, so the range advantage of a higher power LED over a lower power one will usually be somewhat less than the calculated square root ratio of the input power difference would suggest.

Integration of both Portsdown and MiniTioune DATV equipment into a fully working optical system will be described in Part 2, together with several of the more interesting results that were obtained. Much head scratching and an elevated rate-of-learning has characterised this period, and hopefully will continue to do so as more work is done. 🐼



CAT18 Report

Rob Burn G8NXG

In an unusual coincidence, the setting for CAT18 once again shared space with aeroplanes; not unlike CAT16 at Telford. This time we were guests of the Midland Air Museum which sits next to Coventry Airport. Coventry Airport is a small regional airport in business to provide facilities for private pilots and business flying using smaller planes.



Segregated but next to the airport lies the Midland Air Museum which celebrated its 50th anniversary last year. Operated by a group of trustees and volunteers with assistance from a staff team of four members the museum aims to provide a way for members of the public to come up close to some of the most iconic aeroplanes developed in the UK – plus a few from overseas!

Luckily for the BATC, the museum also has a dedicated and spacious airy building designed for holding club and society meetings etc., with accommodation for up to 80 people. It was this room, coupled with the part use of a hanger for displays, bring and buy etc. which appealed to the organisers of CAT18 and thanks are due to Ciaran Morgan MOXTD who suggested the venue.



In line with previous years, the event was held over a weekend, with the first day morning organised as free time to wander around the museum and aeronautical displays; plus the hanger in which the ATV displays, Portsdown clinic and bring and buy areas were set up. During the afternoon session the first tranche of talks were delivered and the session closed at about 5:00 PM

Portsdown news

The first talk of CAT18 was delivered by Dave, G8GKQ, 'Father of Portsdown' in which he explained the development of this DATV transmitter. I doubt if Dave expected to be continuing with its development over almost two years after ideas for this transmitter were first mooted! Anyway, no-one can doubt its success, with 280 users and sales of over 100 SD cards and F-M boards. The arrival of the Stretch operating system has been absorbed and further expansion has taken place to enable a Portsdown to become a 'TV Amateurs Toolbox'!

Dave explained his thinking behind the introduction of many new facilities and explained all of the new capabilities. He also provided a teasing insight to what is planned for the future!

Activity Updates

This session covered three areas: activity days and contests, then activity at 5.6GHz and 71MHz.

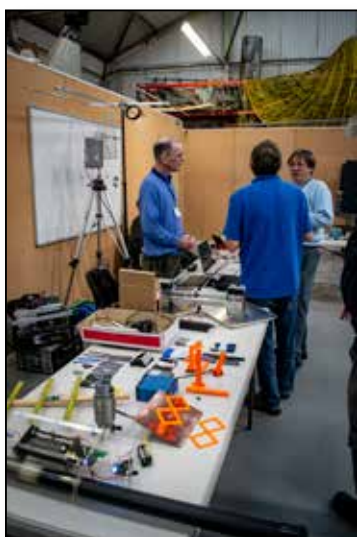
Clive G3GJA covered activity days and contests, describing 2018 IARU contest participation and results plus the BATC UK only contest for the NoV bands. He then proposed ideas about the timing of contests and activity days. Do you have any view about the existing timetable? Would you like to see weekday events? Whatever, do get in touch with Clive with your ideas: contests@batc.tv

The 5.6GHz Activity Update was delivered by Noel G8GTZ and Brian G4EWJ.

Noel described the fun which could be had from investing in inexpensive 5.6GHz Rx and Tx units designed for drone use and how to go about connecting it all together and getting your first contact.

Noel also highlighted some of the Rx/Tx distances which could be achieved with adequate preparation.

Brian G4EWJ then proved this by explaining some of the results of 5.6GHz operation in North Wales and started with a few tips on where to obtain suitable amplifiers and LNBS. He went on to describe a 101km contact over a sea path from Dolphin (near Flint) to Birkrigg Common, near Ulverstone and another of 138km between Esclusham (near Wrexham, 1300ft) to Corney Fell, Cumbria (1000ft); finally Bylchau (near Denbigh, 1400ft) to Kirkstome Pass (near Kendal, 1450ft) – a distance of 153km. Clearly it is astonishing what can be achieved at modest cost.



Getting going on 71MHz was presented by Shaun G8PVG who commenced his talk with an overview of the new 4m allocation and the RB-DATV parameters for use on the band. Suggestions for transmitters and video sources, amplifier construction and filtering were illustrated before turning to deliberations about techniques for 71MHz

reception. A solution using Minituner and an outboard up-converter plus filtering is the way to go. Shaun concluded his talk by illustrating his practical trials over line of sight paths and perhaps the surprising conclusion is that band is more difficult to work with than perhaps first envisaged.



DATV over optical links

This was the surprising title of a presentation about DATV transmitted using an optical method. It was delivered by Bernie G4HJW and is said to be very much a work in progress.

The theory of operation is to transcode a DATV signal (perhaps down-converted from the 'ugly' output of a Raspberry Pi) to "base-band"; then filter and feed this signal to a LED driver then to a red or white LED. Transmission and reception would be via Fresnel lenses and being in the dark about 30 metres can be achieved. Bernie discussed various aspects of LEDs and managed to inject a fair degree of humour in his presentation!

Nearby, in the village of Baginton, there is a pub known



as The Oak and it was here that many members met up for drinks and an informal meal together in the evening. Because of its proximity, Coventry Airport was once known as Baginton Airport and was used for the defence of Coventry during WWII as RAF Baginton.

Day two was given over to talks in the morning and the bi-annual general meeting in the afternoon. This was followed by a short committee meeting to elect our Chairman, Secretary and Treasurer.

OB and the MCR21 project

Brian G8CQS delivered his presentation of Life and Times in Outside Broadcasting followed by a talk on the MCR21 Project.

Brian covered the very early days of what came to be known as scanner vans; the earliest electronic type being made in 1937. We were shown the development of these vehicles over many years and Brian also described some of the OB installations at a couple of major sporting venues – it looked to be jolly hard work!

He then moved on to talk about the MCR21 project. A



trust has been formed to enable the restoration of one of the final monochrome BBC OB vans, to 1963 condition when it was new. It will then be used to demonstrate and explain the history of television outside broadcasting. The trust has the support of the Heritage Lottery Fund and further grants are being applied for to start work on the engine, chassis and body. Brian is concerned that this van and its technology can be passed on to the next generation of broadcasters. Look at www.mcr21.org.uk for a fascinating TV history lesson! Of course, for a fine example of how technologies have changed over time you only have to look at the BATC's 'OB' unit, operating from the rear of the lecture room with four camera feeds, audio and internet streaming...

ATV in Space

Graham G3VZV introduced the session about the use of ATV in space, with contributions from Ciaran Morgan M0XTD who is the ARISS Team Leader and Phil Crump M0DNY.

Ciaran covered the current situation and plans for



HamTV on the ISS. He commenced by describing the the interoperable radio system borne out of the need to provide independent power supplies to the amateur radio equipment – that is independent of systems within the ISS. A design for this power supply is under test and the hope is that it will be suitable for sending to the ISS in the not too distant future!

Ciaran then moved on to the HamTV situation. After

some two years of successful use, the Ham TV unit developed a fault early this year. Investigations on board ISS have not resolved the problem, so there is agreement to down-mass the TV transmitter for repairs to be carried out. Assuming that repairs and flight certification are successful, the outline plan is to send the transmitter to the ISS during Q4 of 2019. We will be a long time without TV!

Also recently deployed aboard the ISS is the MarconISSta VHF/UHF/SHF spectrum analyser which is successfully sending data back to earth. Once these experiments have been completed, the plan is to turn the hardware over to ARISS. Ciaran explained that this will then provide an opportunity to re-purpose the hardware for other experiments – suggestions included an L band uplink or L/S band repeater. Further suggestions would be welcome!



Space ISS Ham TV update – Phil M0DNY

Phil provided a brief overview of the operation



of the Ham TV system when deployed for school demonstrations, describing the challenges of maintaining a reliable programme feed to the school venue. The incoming TS streams arriving from multiple ground stations tend to be out of sync with each other, so a method of using the PCR (program clock reference) timestamps was developed to synchronise ground station feeds.

Es'hail-2 – Graham G3VZV

The current state of the Es'hail-2 project was presented by Graham, covering launch arrangements (which remain tentative at the moment), likely coverage and proposed bandplans. In addition to our interests in ATV, the new satellite will provide TV broadcasts, broadband connectivity and government services to Qatar, parts of the Middle East, North Africa and Europe.



► Graham, G3VZV, and Dave, G8GKQ, setting up a dish to demonstrate reception of BADR-4

Graham also proposed some initial dish installation advice – look for BADR-4 which occupies the same location at 26 deg east and features a number of unencrypted DVB signals – useful for testing.

The proposed bandplan was discussed, as were the 'Do's and Donts' of amateur use

of Es'hail-2. One sure way to get Es'hail-2 off the air is to abuse use of it.

A look into the future

The final talk of CAT18 was delivered by Charles G4GUO. As Noel pointed out, many of the technologies we use today were described by Charles in previous years; some of what Charles describes could possibly become the 'norm' in years to come.

One such concept is Phase 4 Ground, an Open Source satellite ground station project primarily intended for AMSAT and the Radio Amateur community. The idea is to provide an uplink in the 5GHz band, which would downlink at 10GHz and be open to anyone who has the skills and expertise to develop the hardware and software to take advantage of such a system. Charles is experimenting with an Ultra96 processor board plus a FMCOMMS4 evaluation board to create such a system and is also investigating a linear 400 mW driver stage based on the SE5004 device. The final goal for all of this will be a single board transceiver to cover 70MHz to 6GHz; 10GHz receive via a LNB with DVB-S2X software modem included!

Charles moved onto his thoughts about the non-linearity of PA stages and the concept of Digital Pre-Distortion (DPD) to overcome non-linearity. Straightforward hardware fixes such as wideband decoupling and correct termination of harmonics must be implemented first. There is a commercial RF PA 'linearizer' (RFPAL) solution available (the Maxim SC2200) intended for use in the cellphone market and this device may be suitable for proof of concept for ATV use.

Finally, Charles described his trials and tribulations with developing a 71.5 MHz power amplifier using a NXP MRF300AN transistor. Sadly, this turned out to be too powerful (and too hot!) for his DPD experiments; this has been shelved for further thought.

Summary

CAT18 provided a number of advantages for ATV enthusiasts to attend. Centrally situated near Coventry, it provided an easy travel opportunity for many UK members to visit. The venue



itself had plenty of car parking space and was not too far away from hotels for an overnight stop. There was plenty to see in the demonstration area, and the talks were quite amazing when you consider the breadth of coverage – almost DC to 5.6GHz with only a slight hop over the HF bands...

All of the presentations were streamed via the BATC streamer and recorded at the time; these video recordings are now available on the BATC YouTube channel, BATC Online. Many of the subjects covered in CAT18 are featured in this issue of CQ-TV - with more to follow in future editions.

Those of us who recall 405 line monochrome days could seek an injection of nostalgia at www.mcr21.org.uk; while interesting information and parts can be seen at

<http://www.g4ddk.com/>;

<https://www.minikits.com.au/>;

<http://www.spectrumcomms.co.uk/>

and <http://www.ifwtech.co.uk/> 📺



► Frank, MOAEU and a volunteer form the air museum in the cockpit of the Vulcan bomber. Photo Chris - MW0LLK



BATC at Goonhilly

Noel Matthews G8GTZ



At the end of August a small team including G3VZV, G8GTZ and G8GKQ returned to Goonhilly to install the hardware for the BATC sponsored Es'hail-2 SDR and monitoring facility and also had the opportunity to carry out more EME tests using the 32 metre GHY6 dish.

The Es'hail-2 monitoring facility uses a i7-2600 PC with 16GB of DDR3 memory located in a dedicated equipment room alongside the AMSAT UK Funcube monitoring station. This PC will directly serve both the narrow band web SDR and the wide band spectrum monitoring facility over a high bandwidth network connection supplied by Goonhilly Earth Station.

The 1.3 metre offset dish is mounted on the roof of the building and has been aligned using the BADR4 satellite.

The system will provide a web SDR facility for the narrow band segment enabling viewers to tune and decode the narrow band signals and also a spectrum monitor for the wide band transponder. This monitor will be presented on a web page alongside a chat window where users are requested to describe their transmission parameters.

The system hardware is tested and it is expected the PC will be installed during November in order to be ready for the satellite commissioning in late Q4 or Q1. See

<https://eshail.batc.org.uk/> for more information and the latest status reports.

We are very grateful to Goonhilly Earth Station Ltd for their tremendous support and passion for space.

Goonhilly EME

While we were at Goonhilly there was an opportunity to use GHY6 for more EME tests on 3.4 and 5.6GHz. This is Brian - G4NNS's report as published in the latest "432MHz and above EME" newsletter:

"The story of the recent Goonhilly Dish EME Tests

– On the 1st and 2nd of Sept a group including myself, G8GTZ, G8GKQ and G3VZV were able to activate the 32 m antenna, GHY6, at Goonhilly Down on the Lizard peninsular in South West England. This site is a centre for satellite communications, but as satellites became more sensitive and powerful and with the advent of undersea fibre optic cables the larger antennae have become redundant. GHY6, is to be re-purposed for the deep space network and we had what is probably the last chance to use this antenna for amateur radio before this happens. We operated on 9 cm and 6 cm.

Despite the weekend and times available not being ideal for EME, we had 16 QSOs on 9 cm and 19 on 6 cm. We were running about 50 W on 9 cm but the feed system return loss was only 8 dB as we were below the design frequency of the feed. We did add an isolator to protect the PA. On 6 cm we were running 40 W. We received plenty of (599) reports so the system was working. Thanks to all those who came on to call us. QSL requests should be emailed me and I will QSL direct. We were also able to give some operators new to microwave EME a chance to operate with this system and to give demonstrations to visitors to Goonhilly Earth Station. When conversion of GHY6 for the deep space network starts it will no longer be available for amateur radio, but we are hoping that GHY3, a 29.6 m antenna with a conventional Cassegrain feed may be available. So, we are thinking of suitable feeds and looking for ideas." 📡



► Two dishes in the early evening sunlight - GHY 6 on the left, and GHY3 on the right

Video Fundamentals 15

Wire, labelling & MCR21

In this 15th monograph, I would like to tackle a different subject this time, about wiring.

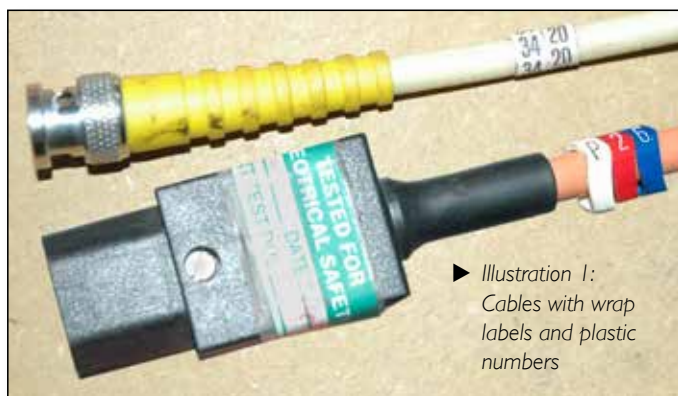
Once you get more than a few wires going from A to B it become increasingly difficult to sort them out and make changes etc, along the lines of; well were does this one go then?

The solution to this is obvious but often not implemented till you have forgotten and then it is too late. I know this is a statement that is easy to say, but it must be written down as you go along. In the long run it will save you time, much better than tugging at a wire in the vain hope you can see the other end move.

Professionally the "wiring schedule or run list" is prepared at the design stage and it provides the build instructions and a permanent record for future repair/modification work. Other benefits are calculations for the length of cable, number of connectors, cable markers to order. It is a great time saver, and prevention of cost overruns, to get this correct.

The basic information needed is:- cable number, from equipment, connector, to equipment, cable type, cable function. This can be expanded as needed.

For my video installation at home I make notes on paper and transfer to a spreadsheet for tidiness and printing out.



► Illustration 1:
Cables with wrap
labels and plastic
numbers

How to mark the cables? I re-use a lot of existing cables cutting off one end and salvaging the cable markers then replacing them in the new order. Then I re-make the cut end to the correct length using crimp connectors, this is quite quick with practice. It makes it all much neater. Sometimes I use sticky label number strips. Search for "Cable Markers". Failing all this the backstop is white PVC insulating tape and a felt tip marker.

Brian Summers G8GQS



If you have not used crimp BNC's, I can assure you these are the best thing since sliced bread! With the correct tools, connectors and cable I can fit an end in less than 2 minutes once all the bits are to hand.



► Cable loom behind video jackfield

Some thought and advance planning needs to go into how the cables are laid out or "loomed". In the photo the cables to the jackfield are in a big "U" shape, one group for each row of jacks. This enables the jackfield to be drawn forwards from the equipment bay for maintenance or modification. It is not easy to get them organised and looking nice, my effort as in the picture falls a long way short of a professional wireman's work.

It is easier to start the wiring on the floor not in the equipment bay, get the cables combed out into shape and tie wrapped, then move it to the bay to continue on to the destination.

I find using offcuts of 1.5mm domestic as temporary (permanent?) fastenings, adding the tywrap when (if) finished.

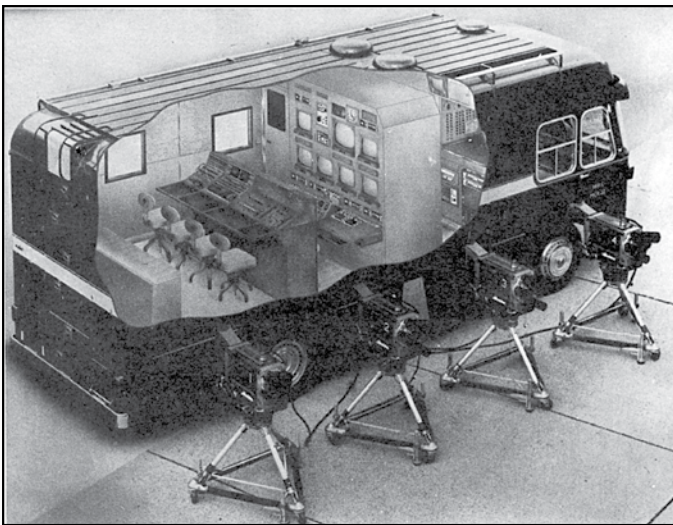


One reason for choosing this subject is the project to restore the outside broadcast van BBC MCR21. This has featured at many BATC events going back as far as the 1980 convention as reported in CQ-TV 112. This has concentrated my thoughts around the wiring schedule or run list that will need to be created for this job.

MCR21 BBC Mobile Control Room No.21

Now is the time for it to enter a new phase in its long history. Originally built by Pye in 1963 to an exacting BBC specification. It has been through many changes and upgrades, but now it is 55 years old. It predates, Micros, IC's, PAL colour, CCD's, Plumbicons, indeed it is much closer to the birth of electronic television than it is today.

The plan is to go back to its original 1963 condition to give it its correct place in history. To carry out this restoration we have set up a charitable trust, the BTTT, to own MCR21 and ensure its future.



► Cutaway view of MCR21 with 4 cameras

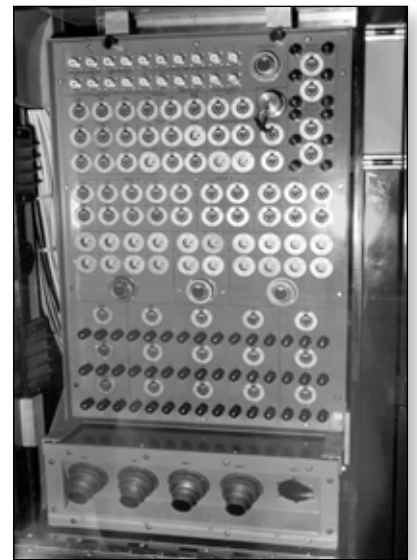
There will be many elements to the MCR21 Project. The restoration of the oldest and most original surviving television outside broadcast unit will be the centre-piece of the Project.

MCR21 will be restored to its near original state, painted in its original livery of dark green with a grey stripe and the BBC crest on the side. The unit will carry its original equipment and two Pye Mk VI Image Orthicon cameras.



This is the technical tailboard for MCR21.

To give an indication of just some of the cabling needed. There are 20 video & RF in-outs, 26 assorted talkback/cue XLRs, 20 Microphone input XLRs, 3 Multi Mic connectors with the breakout XLRs and 15 in-out "lines circuits" with binding posts. At the very bottom are 4 Mk4b Camera cable connectors.



There are some interesting oddments, A connector dedicated to Eurovision, a balanced video output for twisted pair, and a special XLR & binding posts for the GPO telephone. In 1963 the GPO was very protective of its circuits and telephone instruments, it was quite difficult to get a telephone installed in an OB vehicle and A GPO engineer had to do the installation.

We are going to make it available at public displays, meeting, and at museums. There will also be information about MCR21 on display and on the Broadcast Television Technology Trust's website. The website will carry much more information about the technology and the people who worked behind the cameras. While the displays will be as entertaining as possible education will play a big part. The aim is to encourage people, particularly young people, to take an interest in broadcast television technology.

As you can imagine there is much to be done, not least the wiring!, but we are fortunate to have the support of Industry, The Heritage Lottery Fund, The National Media Museum, The BBC, and CTV OBs. to name a few.

We will need much help from volunteers, if you would like to join with us in this important project, or have information/equipment that would be useful, or wish to sponsor us, please get in touch. 📧

Footnotes:

BTTT = Broadcast Technology Trust

Contacts

Nick Gilbey rndgilbey@gmail.com

Brian Summers brian@mcr21.org.uk

CAT18 OB lecture

www.mcr21.org.uk

www.tvcameramuseum.org

Video = <https://vimeo.com/275057027>



Es'hail-2 Wideband Transponder

Operating Guidelines and Bandplan

Dave Crump G8GKQ

The following operating guidelines and proposed bandplan are designed to enable the most efficient use of the 8MHz wide transponder for all users. It is expected that these initial guidelines will be further developed after commissioning.

Coordination

Due to the very large number of variations of transmission parameters, it is essential that all users notify their transmission parameters on the co-ordination chat room page that has been established by AMSAT-DL and the BATC at www..... (URL tbd)

Transponder Usage

As a general principle, the transponder should be only be used for short-duration tests and contacts. The only long-duration (more than 10 minute) transmissions should be:

- ▶ The TV beacon channel uplinked from Qatar or Bochum.
- ▶ Video of the live proceedings of AMSAT and Amateur TV Lectures and Conferences of wide interest. Examples might include:
 - ▶ National AMSAT Conferences
 - ▶ National Amateur TV Conventions

The following content is unacceptable:

- ▶ Recordings of events, or broadcast of events not explicitly concerned with Amateur Satellites or Amateur TV
- ▶ Transmission of any copyright material (such as movies or TV channels)

- ▶ The relaying of terrestrial AmateurTV Repeaters is discouraged unless the content is of exceptional amateur radio interest.

Transmission Power

All uplink transmissions should use the minimum power possible. No transmissions should have a downlink signal with a higher power density than the Beacon – the web-based spectrum monitor will enable users to set their uplink power to achieve this.

Transmission Modes

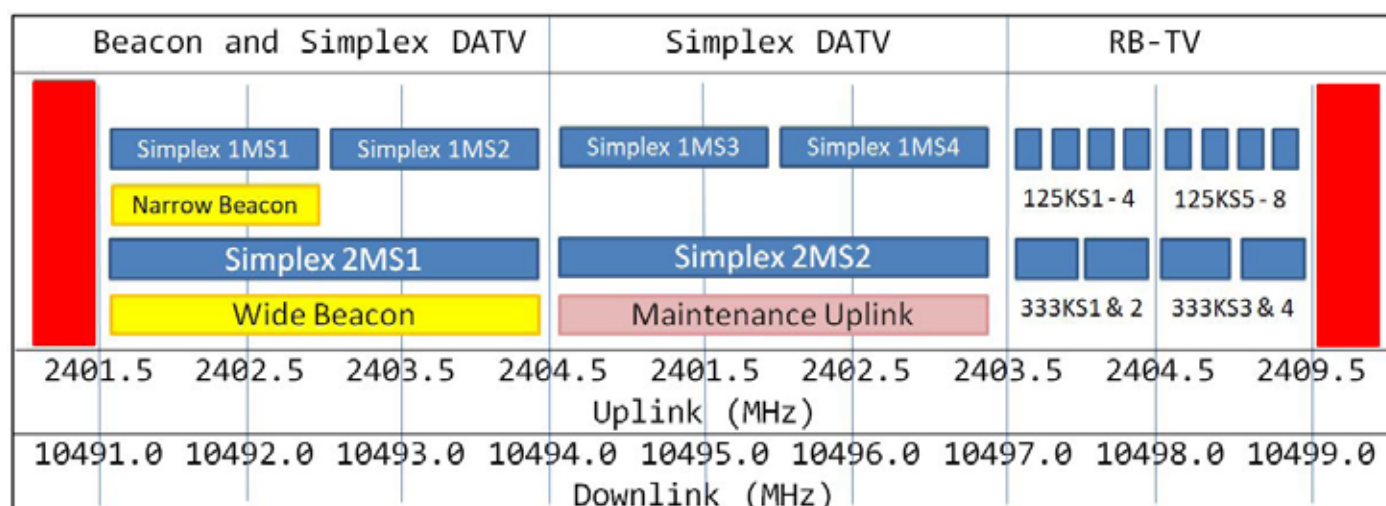
Transmissions should use DVB-S2 where possible. For normal standard definition transmissions, 2 MS is the maximum symbol rate that should be used.

To enable easy decoding PIDs should be set as: Video 256, Audio, 257, PMT 32 or 4095, PCR 256 or 258. Service Name should be set to CallSign. PMT PIDs 4000 – 4010 should not be used. Users are encouraged to experiment with higher-order DVB-S2 modes at lower symbol rates (for example 333 KS 32APSK) to conserve bandwidth for other users.

On Wednesdays (UTC time), experimenters are encouraged to try other modes – perhaps 6 MS using the whole transponder for brief (less than 10 minute) periods. It is essential that users to announce their plans on the chat room page, and to always monitor it.

Beacon

The beacon will initially run 24/7, but it is anticipated that, as more users become active, this will be reduced to a shorter period every hour.



Role	Symbol Rate	Uplink Freq MHz	Downlink Freq MHz	Designator	Notes
Beacon Wide	2MS	2403	10492.5	2MS1	Initial Beacon Mode
Beacon Narrow	1MS	2402.25	10491.75	1MS1	Possible future beacon mode
Simplex	2MS	2403	10492.5	2MS1	Only available outside beacon hours
Simplex	2MS	2406	10495.5	2MS2	
Simplex	1MS	2402.25	10491.75	1MS1	Only available outside beacon hours
Simplex	1MS	2403.75	10493.25	1MS2	Only available outside beacon hours or when beacon is in narrow mode
Simplex	1MS	2405.25	10494.75	1MS3	Only available if 2MS2 not in use
Simplex	1MS	2406.75	10496.25	1MS4	Only available if 2MS2 not in use
Simplex	333KS	2407.75	10497.25	333KS1	
Simplex	333KS	2408.25	10497.75	333KS2	
Simplex	333KS	2408.75	10498.25	333KS3	
Simplex	333KS	2409.25	10498.75	333KS4	
Simplex	125KS	2407.625	10497.125	125KS1	Only available if 333KS1 not in use
Simplex	125KS	2407.875	10497.375	125KS2	Only available if 333KS1 not in use
Simplex	125KS	2408.125	10497.625	125KS3	Only available if 333KS2 not in use
Simplex	125KS	2408.375	10497.875	125KS4	Only available if 333KS2 not in use
Simplex	125KS	2408.625	10498.125	125KS5	Only available if 333KS3 not in use
Simplex	125KS	2408.875	10498.375	125KS6	Only available if 333KS3 not in use
Simplex	125KS	2409.125	10498.625	125KS7	Only available if 333KS4 not in use
Simplex	125KS	2409.375	10498.875	125KS8	Only available if 333KS4 not in use

Notes:

1. DVB-S2 users are requested to use the steepest roll-off that their equipment is capable of to reduce the possibility of adjacent channel interference.
2. Recommended spot frequencies for various usages and symbol rates are listed above
3. Uplink 2401.5 – 2409.5 MHz RHCP, Downlink 10491 – 10499 MHz Horizontal

BATC members and DATV in Spain

EA3CNO and EA3ANS members of the BATC, were present at the 25th Mercat de Cerdanyola Fair, organized annually in Cerdanyola (Barcelona) last 9th and 10th of June, at the stand of the URC. Unió de Radioaficionats de Catalunya. They presented and tested the narrow digital television RB-TV modality, at the frequency of 434,500 Mhz with a symbol rate of 333 Kb / s. The demonstration attracted the interest of many colleagues who will possibly be added to the already important group that works amateur television in Catalonia.



Getting ready to receive Es'hail-2

Noel Matthews G8GTZ



Whilst the BATC web SDR at Goonhilly will provide a means to listen to the narrow band segment, it will only provide a spectrum monitor for the wideband DATV segment and if you want to decode any of the signals, you will need to set up a system at home.

The expectation is that the wide band DATV transponder will be able to be received in most of the UK on a 1 metre dish and it may even be possible use a smaller 80cms offset dish. This article primarily describes setting up a dish and equipment to receive the wideband transponder but the techniques can be used to set up a dish to receive the narrow band transponder, where a smaller dish will be adequate for most areas of the UK.

Equipment required – a dish

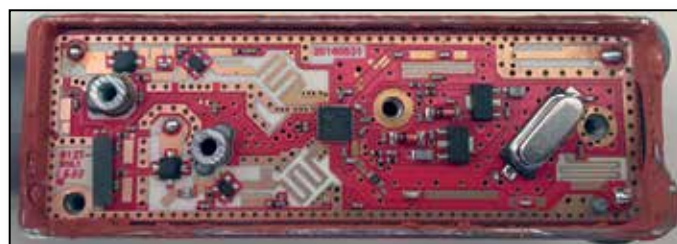
As mentioned above, to receive the wide band transponder, ideally you will use a 1 metre or larger dish to receive Es'hail-2 although it may be possible to use a smaller 80cms dish. Larger dishes are available on ebay and a number of members have recently purchased brand new 1.2 metre dishes for £20. Your local domestic recycling facility (AKA the tip!) can also be a useful source of dishes and second hand 80cms and 1 metre dishes are often available on Gumtree.

Even an 80cms dish will have 30 dB plus gain at Ku band with a very small beam width of approximately 2.5 degrees making mounting and aligning the dish very critical.

Equipment required – Low Noise Block (LNB)

Just like any consumer satellite system, you will need an LNB at the dish to convert the 10 – 12GHz Ku band signals down to L Band which can then be decoded by the satellite receiver. Whilst any modern Ku band satellite LNB will receive the BADR4 signals, it is recommended that you use a Phase Lock Loop LNB to receive the Es'hail-2 amateur signals. This is because the frequency stability of a standard DRO unit will make it difficult to receive the Narrow Band transponder SSB signals and Reduced Bandwidth DATV (RB-TV) signals on the wide band transponder.

The most common unit is the Octagon Optima PLL OTLSO LNB (Beware there are a number



of other Octagon units available which are standard DRO LNBs – ensure you buy the OTLSO PLL unit).

These are a very good example of modern microwave integrated design – as the picture shows it contains very little silicon and uses the Rafael RT320M at its heart, which is a dual synthesizer, dual mixer, RF switch and logic chip with a 25MHz reference crystal. You will see some frequency drift when resolving SSB signals with this LNB and it is possible to improve the frequency stability by locking to an external source but that is beyond the scope of this article.

Other units PLL LNBs are available such as the Goobay unit are also currently available on ebay.

Narrow band Receive equipment

Using one of the above LNBs means that the IF frequency fed down the co-ax to your receiver will be in the range of 739.55Mhz to 739.80MHz for the narrow band transponder and 741.0MHz to 749.0MHz for the wideband or DATV transponder.



To receive the narrow band transponder you can simply use an SDR receiver such as FUNcube dongle, Lime SDR or the cheap RTL dongle which will cover the IF frequencies from the LNB. Alternatively, if you wish to use an amateur band receiver on HF, 144 or 432 MHz you will need an additional unit to convert the IF frequencies to your amateur band of choice.

You will also need to arrange to feed 12 volts DC up the co-ax to power the LNB – this can either be done internally in your receiver or by an external bias tee. (Note: 12v and not 18v will be required to receive the vertically polarised Es'hail-2 narrow band transponder.)

Wide band Receive equipment

To receive the wide band, horizontally polarised DATV transponder you will need a DATV receiver capable of receiving 741 MHz to 749MHz. Unfortunately this is outside the normal tuning range of a consumer digital TV Set Top Box (STB) and you will need an additional up converter to shift the IF frequency up to be in the tuning range of the STB at L-band between 950 – 2150MHz.

Such converters are available, however there is a USB tuner designed specifically for Amateur TV use which covers down to 143MHz and is suitable to receive Es'hail-2 with no modifications or additional up-converter.

These units are called MiniTiouner and are available from the BATC and other sources and are used with the MiniTiouner software developed by F6DZP to receive and decode the signals. See <https://wiki.batc.org.uk/MiniTiouner> for more details. The other reason why MiniTiouner is the preferred solution to receive the DATV transponder is that most amateur TV transmissions are expected to use Reduced Bandwidth DATV (RB-TV) with a bandwidth below 1 MHz. Unfortunately standard consumer STB will not receive these RB-TV signals but MiniTiouner has been designed to receive RB-TV signals with less than 100 KHz bandwidth. Note - there will initially be a DATV beacon transmission running at 2.4Ms (3MHz bandwidth) which can be received using a standard DVB-S2 receiver and appropriate up converter.

Note that the DATV receiver will need to be capable of providing 18v DC to the LNB to select horizontal polarisation required for the wide band transponder.

Aligning the dish

Whilst the actual launch date for Es'hail-2 has not yet been released it is already possible to set up and align your dish and test your decoder using an existing broadcast satellite called BADR4. BADR4 is in the same orbital slot that Es'hail-2 will occupy and has a European wide spot beam carrying a number of free to air TV services including the BBC Arabic service which can be received throughout Europe.

The first step is to check that you are going to mount your dish in a position in a position where it can see the satellite – as a rough guide Es'hail 2 is only 2 degrees to the south of where the Astra satellite transmitting Sky and Freeview is positioned at 28 degrees east of south. (Note the bearings are referenced to the South and therefore Sky is further round to the east (or left!) than Es'hail 2.



► Footprint of BADR4 downloaded from Lyngsat.com

<http://www.dishpointer.com/> is a very useful site to check if you have clear take off in the required direction – simply enter your QTH postcode and select BADR4 as the satellite and it will overlay the direction to the satellite on a Google satellite view so you can see which neighbours house to aim for! The panel below the map gives you azimuth and elevation from your QTH and LNB skew angle.



Another useful site is <https://www.suncalc.org> which tells you exactly where the sun is in the sky at your QTH at any particular time – using this information you can tell when during the day the sun is on the same Azimuth as BADR4 and use this to align your dish.

Also, near every equinox, the sun passes through the same position in the sky as a given satellite – using this website <https://www.satellite-calculations.com/Satellite/suninterference.php> you can calculate when the sun will be in the same position as BADR4 – this happens for a few days around the 10th of October 2018 for the UK and as long as it is sunny, you will be able to see where to place your dish by seeing where there is direct sunlight.

Aligning the dish with a DATV receiver

Once you have the dish mounted securely and pointing in roughly the right direction, you need to set up your LNB and receiver – note a Sky STB is not suitable and you must use a Free To Air STB.

Whilst MiniTiouner is the recommended system to decode DATV signals on the Es'hailsat wide band transponder, it is recommended that you use a standard free to air satellite box or satellite finder to align the dish on BADR4. This is because you will need to configure the LNB to run the correct local oscillator for the channel you want to receive plus you need to ensure you are using the correct polarity.

Next you need to know what parameters to set in your STB – this will depend on what channel you want to receive and for a full list of channels available on BADR4 see this Lyngsat page. <https://www.lyngsat.com/Badr-4-5-6.html>

Most people have used BBC Arabic as the test signal – Lyngsat gives the following parameters:

- ▶ Frequency = 11,996MHz which means you need to select the LNB LO frequency to be “high” or 10.600MHz and then set your receive frequency to 11,996MHz.
- ▶ Horizontal polarity means you will need 18 volts on the LNB feed
- ▶ Symbol rate 27,500 and 3/4 FEC will need to be selected in the satellite set up menu

If you have an SDR or spectrum analyser these will be useful during the alignment process and should be connected in to the LNB feed via a splitter with the STB on the other leg providing volts and 22KHz tone. A DC block should be used to ensure no damage to the analyser and also to ensure no incorrect voltage is fed in to the LNB.



If you do not have a set top box and need to use a standard MiniTiouner, which does not produce 18v or 22KHz on the LNB feed, you can use the following method for setting up your dish:

Rotate the LNB on the dish mount through 90 degrees so the satellite cable comes out of the LNB at 90 degrees to vertical – this will mean that you can use a 12v feed to receive horizontal signals.

Because you are not sending 22KHz up the co-ax, the LNB will not switch in the higher frequency Local Oscillator and will use the 9,750MHz oscillator and you will need to enter 02246000 in the MiniTiouner frequency panel ($11996 - 9750 = 2246\text{MHz}$). Note that you can only do this in MiniTiouner as a standard STB will not tune above 2150MHz.

The easiest way to find the strong satellite from Astra (Sky) at 28 degrees East and use the SDR, sat finder or analyser and watch for several 27MHz wide signals to appear. Once you have peaked on the signal you need to decode a program to try and identify which satellite you are actually receiving. Do a satellite or transponder scan with 27,500 SR, H and V polarity and auto FEC and see what appears – these are very common parameters and almost all European satellites have signals which will decode using them. Now refer back to Lyngsat to try and identify which transponder you are actually viewing by looking at the various satellite program lists.

Once you know which satellite you are receiving, work out which way the dish needs to be rotated and set your receiver for the BADR4 BBC Arabic service (11996MHz, 3/4 FEC and 27500 SR) and tweak the dish round until you see it start to decode. If you are looking on an analyser or SDR, BADR4 is much weaker than Astra at 28 degrees or Eutelsat at 13 degrees and if you are starting to see another set of very strong signals, you have probably gone too far! Note – there is a 2nd BBC Arabic channel on Eutelsat at 13 degrees.

Once you are sure you are receiving BADR4, tweak the horizontal and vertical mounting and LNB skew using either the STB quality meter or MiniTiouner for best MER / SNR / signal quality.



Results

Based on results posted on BATC forum you should see the following results on BBC Arabic channel on BADR4

Dish size	MER or SNR
1.3 metre	12 dB
1.2 metre	11 dB
1.0 metre	10 dB
.8 metre	7.5 dB

For more details see

<https://forum.batc.org.uk/viewforum.php?f=101>

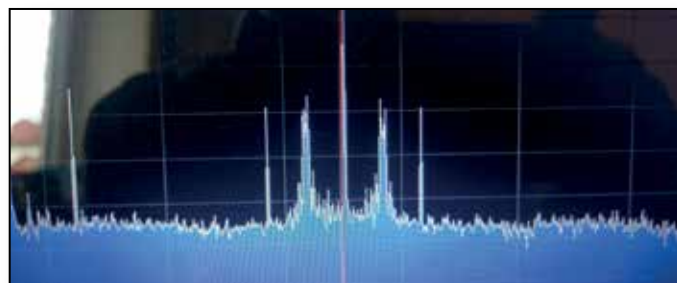
Aligning the dish with an SDR

If you do not have a Digital satellite receiver and want to just receive the narrow band transponder, almost every geostationary satellite runs a narrow band telemetry beacon which can be used to align your dish using just a simple SDR such as FUNcube or RTLdongle.

The beacons are on different frequencies so can be used to easily identify which satellite you are receiving - unfortunately the BADR4 beacon is in the higher frequency band above 12GHz and requires the LNB to be fed with a 22KHz tone to switch in the higher local oscillator which is not easy to do using a standard SDR. However, the BADR 7 satellite is in the same orbital slot and has a telemetry beacon which is receivable throughout Europe on 11,200.5MHz which gives an IF signal on 1450.5MHz – you may have to tune +/- 100KHz depending on the stability of your LNB.

Use the same dish alignment procedure described above but monitor 1450.5MHz on your SDR waterfall – you will see a high level of wideband noise from other satellite signals such as Astra at 28 degrees but should clearly see the beacons carriers when aligned on BADR7 at 28 degrees.

Note the BADR7 beacon is horizontally polarised so you will either need to feed the LNB with 18v or physically rotate the LNB by 90° as described above if you only have 12v available. And don't forget that Es'hail-2 Narrow band is vertically polarised so when alignment is complete on BADR7 you will need to switch back to vertical polarisation.



► BADR7 beacon received by G7JTT on an RTL dongle

For more information on other satellite beacons check out this site: http://frequencyplansatellites.altervista.org/Beacon-Telemetry_Europe-Africa-MiddleEast.html

Conclusions

Whilst no actual launch date has been announced for Es'hail-2, it is scheduled for launch before the end of 2018. Using the BADR4 signals or the BADR7 beacon to align and test your system means that once the Es'hail-2 amateur transponders are commissioned, all you will need to do is tune down to 739.55MHz to 739.80MHz for the narrow band transponder and 741.0MHz to 749.0MHz for the wideband or DATV transponder. 🗣️

BATC Awards Presentations at CAT18

In addition to the contest winners published in the CAT18 report, the BATC awarded certificates to those amateurs who succeeded in the BATC Activity Contests. All those in first place received certificates to celebrate the fact; congratulations to the winners and thanks to those who took part. 🗣️

BATC Prizes:

- 1 A £50 Amazon Voucher to the winner of the BATC 146 MHz Contest. Won by a Committee member (**G8GKQ**) with the (then) Chairman second. So not awarded.
- 2 A £50 Amazon Voucher to each station in the Best DX 2-way 5.6 GHz Contact. **G3NWR (G4EWJ)** and **G4CBW** achieved the best DX 2-way 5.6 GHz Contact at 154 km. They are awarded a £50 Amazon Voucher each.
- 3 A £50 Amazon Voucher to the transmitting station using a Portsdown system received at the furthest distance (any band). The best Portsdown DX by a non-Committee Member was **G4LDR** for a contact with G8GTZ at 64 km on 24 GHz. Notably, this was Neil's first contest and he also had a Portsdown contact on 76 GHz.

Band	First	Second	Third
Overall IARU	M0DTS	G8GTZ	G8GKQ
70 cm	G8GKQ	G8GTZ	G4GUO
23 cm	G7AVU	M0DTS	G1LPS
13 cm	M0DTS	G8GTZ	G1LPS
9 cm	G4CBW */ G3NWR *	-	G1LPS
6 cm	M0DTS	G4CBW	G8AGN
3 cm	G4CBW/ G3NWR	-	G8GKQ/ G8GTZ
24 GHz	G8GTZ *	G8GKQ	G4LDR
76 GHz	G4LDR */ G8GTZ *	-	-
146	G8GKQ	G8GTZ	G4CBW/ G3NWR

* IARU Contest Band Winners

Never mind the width - look at the quality

Ian Parker, G8XZD.



One thing the new BATC streamer has shown is that there is huge potential to boost the video and audio quality of our transmitted pictures - both simplex and via the repeater network.

So many people have commented on the vast improvement this has made - so I thought what else can be done to up our game.

Despite it being 2018 many amateurs still seem to be locked into a legacy 4:3 system which has been around for 50 odd years and, even where the move has been made to digital, we still are using a coding system that is more than 20 years old.

We still seem to have our head in the sand in some areas.

One of the great things about the amateur licence is that it allows you to innovate, to experiment and to push the boundaries.

What I'm proposing is not for people to put all their existing equipment in a skip - but to think what can be done with our existing equipment and by spending little or no money.

There has been a tremendous resurgence to the hobby since the Portsdown project came to fruition and one that's constantly being updated - pushing the humble Raspberry Pi to the limit.

For those with the Portsdown or DATV Express / PlutoSDR / Lime mini the addition of a Logitech c920 allow you to go HD using H264, or better, encoding.

This will allow cracking pictures across town, or further, on 70cms, and even on 2m.



I've seen the c920 going for just over £50 new, and a lot less on the popular auction sites. Even being used in SD mode the quality is so much better than some ancient camera full of germanium transistors. And possibly the saving in electricity over the year would go some way towards the cost of buying it.

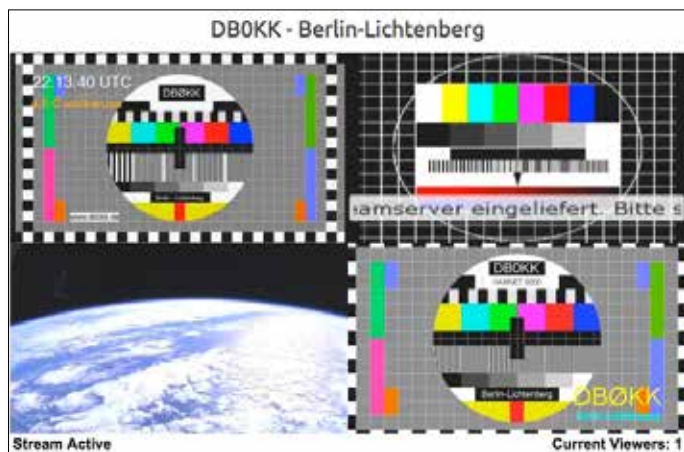
Both the Portsdown and DATV Express can be used in many ways to provide 16x9 pics using H264 or H265 encoding. For example streaming out of vMix - give it a try. How to do it is fairly well documented on the BATC forum/wiki.

In Bristol the Severnside TV group, which runs GB3ZZ, has been experimenting and innovating with some of the newer set top boxes to come on the market.

Experiments have shown a 1M/s picture with H264 looks just as good as H262 at 4M/s - and this can further be improved by using lower symbol rates with 8PSK or 16/32 APSK modulation.

At the time of writing it appears the group has found the first set top box to go below 1M/s. and although it is a bit of a pig to programme good results have been reported at 333k/s.

We also have Es'hailsat-2 to look forward to, which will set the bar higher. I'm told the beacon transmission is likely to be DVB-S2 H264 at either 1080p or 720p. The days of postage stamp-sized pictures that look like slow scan on 20m should long be gone. As amateurs we should be striving for the best quality on whatever budget we throw at our ATV stations. Also part of the hobby is the self training aspect - and we need to show regulators such as Ofcom that we are genuinely innovating (like we have successfully done with RBTv)



► The German repeater DB0KK sending 16:9 format test cards. Please note the one in the top right corner uses a 4:3 test card stretched to 16:9 format!

Yes there are people around with older kit - but there are many who have modern HD-compatible camcorders who are deliberately downgrading their picture quality to feed this backward compatibility legacy.

OK so at the moment there isn't a easily-available HD transmitter that could replace the DTX1 so for most repeater sites this isn't a goer.

However I believe it would be relatively easy to upgrade to widescreen using our existing 625line transmitters and receivers.

My thinking is this:

- ▶ Upgrade existing testcards and video loops to 16:9 - probably the hardest bit
- ▶ Set the receivers to output 16x9 but to auto detect incoming 4:3 or 16:9 So if a 16x9 signal comes in it is passed as is.

- ▶ A 4:3 transmission would sit in the middle of a 16x9 raster with black bars to the left and right.
- ▶ Set the transmitter to output a widescreen flag (easily done on a dtx1)
- ▶ In the listening mode the widescreen testcard is outputted - if a 16x9 pic arrives it passes straight through. If it is 4x3 it appears on a 16x9 raster as a centre cut out.
- ▶ For the users - they set their sat rx to what ever shape their monitor is. So someone on 4x3 gets the centre cut out (looks exactly the same) and the 16x9 tvs get the fuller experience.

What do you think? Which repeater group will be the first to trial widescreen?

Your thoughts please ladies and gentlemen.

Ian Parker, G8XZD.

David Ellis Jones B.Sc, ALCM. GW8PBX (SK)

David's interest in ATV began in the 1960's whilst an Engineering student at Bangor University and continued into his working life at the BBC.

He was a regular attendee at BATC conventions where he demonstrated some of his innovative ideas including colour coders for ATV.

Since establishing an ATV repeater in North Wales, David was a member of the technical team and took an active part in the design and building of GB3TM repeater. In 1994, he applied for the licence and became the licence holder and repeater keeper.

In this capacity he was also a valued member of the Arfon Repeater Group for over 25 years, and advised the group on all ATV matters.

David had plans to rebuild his ATV and HF station in their newly built home in the foothills of Snowdonia, with projects of new antennas systems for digital ATV and a purposely designed shack.

Unfortunately due to ill health this was not achieved. He was also interested in DVB-S commercial satellite monitoring and established a number of dishes and receiving equipment for this purpose.

He was an accomplished classical pianist, violinist and a member of a local Welsh male voice choir.

David passed away on 12th March 2018. He will be sadly missed.

Sincere sympathies are extended to his widow Valerie, his son Dewi and his family. 🕯️



Locking the Octagon PLL LNB to an external reference

Dave Robinson, G4FRE.



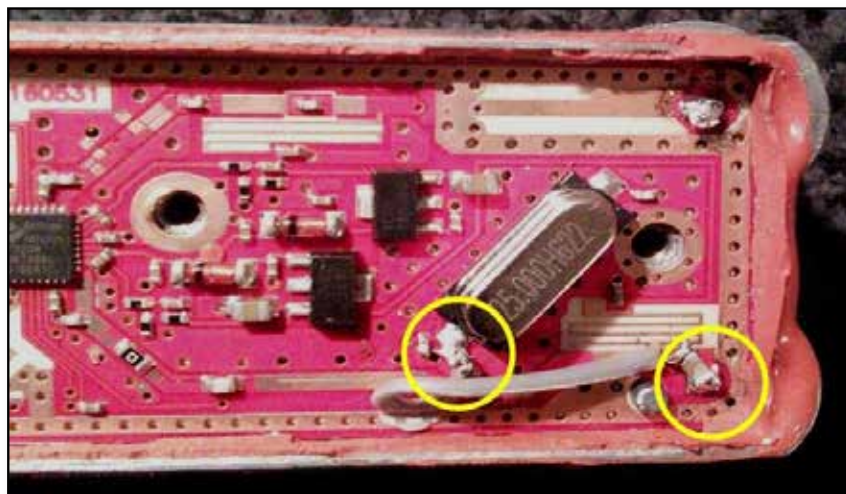
Whilst the Octagon Phase Locked Loop LNB series are significantly more stable than the previous generations of free running DRO based units, there is still room for improvement. The standard PLL unit will be more than adequate to receive signals on the wideband Es'hail-2 DATV transponder; however the Narrow Band performance for SSB and CW signals may not be acceptable for the serious operator.

The latest model of Octagon uses a Rafael RT320M at its heart, which is a dual synthesizer, dual mixer, RF switch and logic chip with a 25MHz reference crystal. Experiments revealed that the stability of the LNB can be improved significantly by replacing the internal 25MHz crystal with an external 25MHz GPS locked source.

There are several modifications published on the internet to do this - this modification is very simple in concept and requires one additional component to be added but should only be attempted by experienced constructors as it is very easy to damage other components around the modification. Note whilst the internal 25MHz crystal is left in situ the oscillator does not run after this modification is done – therefore it is thought that we are replacing the crystal oscillator rather than injection locking it.

Before attempting the modification you need to decide how to get the external lock signal into to the LNB. I chose to use one of the 2 F type cable inputs, however this means it will only be able to receive on one polarity and a second LNB will be required to receive the DATV horizontally polarised transponder without additional circuitry.

First open up the LNB by removing the fixing screws with a robust torx wrench and then prising open the silicon seal. I decided to replace the F type connector with a single hole BNC socket (which has the same thread size) for the 25 MHz input. However this proved to be more difficult than



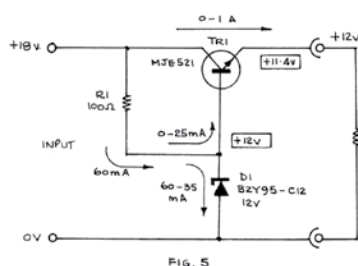
at first thought as not all single hole sockets are created equal!

Once the BNC connector is correctly seated in the threaded hole (or just leave the F type connector), solder an SMD 1nf to the center pin and run a very fine wire from the 1nf to the nearest leg of the 25MHz crystal.

The location of the capacitor and routing of the wire is very critical - it took me 3 attempts and 2 cracked capacitors before I managed to position the capacitor and route the wire and get the lid on fully with all the screws. One wire position caused the LNC to hoot.

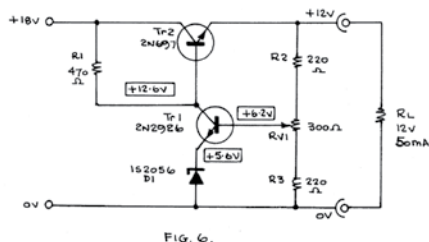
Although tricky to do, the modification is worthwhile and with -10dBm of 25MHz reference signal the GB3CCX 10GHz beacon which is my local signal source is now exactly where it should be in frequency and doesn't drift,



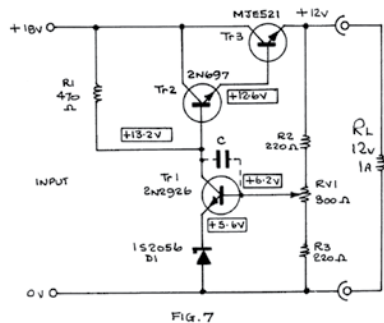


a photomultiplier tube and also power the flying spot scanner head amplifier; simple pulse generator and video processing units that would

be process the signals the tube produced (as previously described). Fig 5 showed how to control a larger current than a zener diode itself could handle, with Fig 6 showing a better stabilised version, where Tr1 controls the series pass transistor, Tr2, rather than the zener diode directly.



and made use of multi-emitter transistors (as VT1 in the diagram). The other major difference was that the signal polarities were the inverse of those in the RTL system (ie for the 2 input examples shown the RTL gave the NOR function for positive logic, but the TTL gave the NAND function.) The TTL was also faster, had better noise immunity, and an output was capable of driving more other gate inputs than applied to RTL. The article then went on to show how some of the basic circuits described in the earlier articles, such as bistables, monostables and counters could be implemented in TTL. (The magazine also included a design for a "fairly simple sync pulse generator" designed by David Taylor G6SDB/T using some of the TTL logic circuits).



A higher current version was shown at Fig 7 - the capacitor C being need to prevent stray oscillations (a value of 500 - 2000 pF being suggested). A further example

used a long tailed pair to compare the voltage across the zener diode with that sampled by RV1 across the output.

Arthur Critchley - at the end of his previous article - had hinted that TTL logic circuits were better than the RTL variant he had described up until then. They were then becoming available at about half the price of the RTL version, and in a larger range of functions (and that was to grow massively as the "74xx series").

Fig.1. 2-input R.T.L. gate

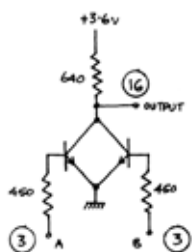
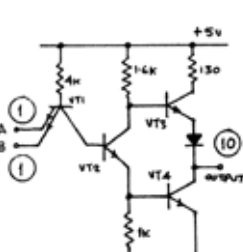


Fig.2. 2-input TTL gate



Arthur began with a comparison of the two types. Whereas RTL was powered from a 3.6V supply, 5V was standard for TTL (at that time - later developments would introduce different ways to fabricate them which could operate with alternative voltage supplies). The basic gate in TTL form was more complex than its RTL equivalent,

The front cover of the magazine had a photograph of the Club stand at the Radio Communications Show that had taken place earlier in the year, whilst the rear cover had a full page advert for Link Electronics Ltd.

Founded by BATC members, John Tanner and Dave Mann, the company was looking for 'Test Engineers' to work on equipment such as the broadcast plumbicon camera shown, at their new premises in Andover, Hampshire.



The British Amateur Television Club

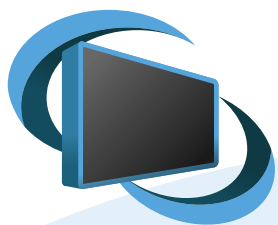


The club provides the following for its members:

- ▶ A colour magazine, CQ-TV, produced for members in paper or .pdf (cyber membership) formats.
- ▶ **Web site** – where you can find our online shop stocking hard to get components, software downloads for published projects and much more.
- ▶ A **members forum** at www.batc.org.uk/forum/ for help, information and the interchange of ideas.
- ▶ A **video streaming facility** at www.batc.tv which enables repeaters and individual members to be seen worldwide.
- ▶ An **annual Convention** held in the UK where you can meet other members, visit demonstrations and listen to lectures.
- ▶ **Meet other club members** at the BATC stand at local rallies across the country.
- ▶ The **BATC Wiki** for all the details of systems and projects for all things ATV. <https://wiki.batc.tv/>



www.batc.org.uk



BATC

Out and About

RadioFairs



Rallies and events with an BATC stand: (subject to change)
More will be added as they become known.

2018

12-14 Oct RSGB Convention
17 Nov Norden, Rochdale

www.rsgbevents.org
www.radars.me.uk

Many of next year's rally dates haven't been announced yet - watch this space for news of a rally near you featuring the BATC stand.
Or if you'd like to assist in hosting a stand, please contact the Secretary!

For a list of all rallies see: <http://rsgb.org/main/news/rallies/>

**If you are able to help on the BATC Rally stands,
please contact the BATC secretary.**

batc.org.uk